National Park Service
U.S. Department of the Interior
Chiricahua National Monument, Arizona

Fire Management Plan
Draft Environmental Impact Statement

September 2004

Summary
Chiricahua National Monument needs to update its fire management plan (FMP) to incorporate new policies and advances in fire research and operations. FMP goals regard safety as the highest priority, and then focus on the use of fire to accomplish resource management objectives, the need to base the program on science, and the requirement that the process be open and cooperative. Three alternatives are retained for analysis in this Draft Environmental Impact Statement. The No Action Alternative allows wildland fire use only in a small fire management unit in the center of the park. Alternative A allows wildland fire use throughout the park backcountry areas and calls for automatic suppression only in a canyon- bottom corridor that contains almost all park developments and burnable historic structures. Alternative B pushes the boundaries of the managed area out to natural watershed limits where the Coronado National Forest is the neighbor (on the north, east, and south sides). Under Alternative B, the Coronado National Forest is an active partner, and the monument's prescribed burn complexes cover a ZOC on Forest Service land. Wildland fire use is also permitted out to zone boundaries. This alternative, both NPS and environmentally preferred, was formulated after suggestions offered at a public scoping meeting. Fire management strategies employed at Chiricahua National Monument would result in some short-term, minor adverse effects but long- term beneficial effects to visitor experience, tourism, cultural resources, vegetation, wildlife, unique sites and wilderness, erosion and debris flow, and air quality.

Public Comment
If you wish to comment on the Draft Environmental Impact Statement, you may mail comments to the name and address below. This environmental assessment will be on public review for 60 days. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

Alan Whalon, Superintendent
Chiricahua National Monument
13063 E. Bonita Canyon Road
Willcox, Arizona 85643
520- 824- 3560

Executive Summary

Chiricahua National Monument needs to update its fire management plan (FMP) to incorporate new policies and advances in fire research and operations. Although careful planning should minimize adverse effects, the monument has prepared this Draft Environmental Impact Statement (DEIS) because of the potential for significant or controversial consequences.

The DEIS is comprised of three major sections: fire program goals and objectives, alternative actions, and environmental consequences. The document presents a range of fire management alternatives, dismisses unreasonable ones, and looks at how well the remaining alternatives meet the program goals. It identifies the core issues that are likely to be affected by fire management activities. Finally, it identifies the environmental consequences likely to result as the alternatives impact each issue.

FMP goals regard safety as the highest priority, and then address the use of fire to accomplish resource management objectives, the need to base the program on science, and the requirement that the process be open and cooperative. The three reasonable alternatives contain different amounts of suppression and wildland fire use (letting natural ignitions burn under pre- determined conditions), but apply the same program of prescribed fire and non- fire fuel reduction treatments.

Other differences among alternatives lie in the delineation of fire management units (FMUs). The No Action Alternative has two FMUs. The first FMU is a small area in the center of the park where wildland fires are allowed to burn. The second FMU covers the rest of the monument, where fires are suppressed to prevent the spread of fire across the monument boundary.

Alternative A, named the Corridor Plan, has two FMUs. The first allows wildland fire use throughout the park backcountry areas. In the backcountry FMU, fires would require suppression at the NPS boundary, since the Forest Plan for the neighboring Coronado National Forest has not yet been amended to allow fire use in the areas just beyond the monument. The second FMU is comprised of a canyon- bottom corridor that contains almost all park developments and burnable historic structures. All fires would be suppressed in this FMU.

Comments received at a public open house resulted in Alternative B, which has two FMUs. The canyon- bottom, automatic- suppression FMU is the same in Alternatives A and B. The boundaries of the backcountry FMU, however, are extended out to natural watershed limits where the USFS is the neighbor (on the north, east, and south sides). Under Alternative B, the monument's prescribed burn complexes cover the ZOC on USFS land, and wildland fire use is permitted out to zone boundaries, as well. This alternative was formulated after suggestions offered at a public scoping meeting and

after the Coronado National Forest agreed that appropriate analysis of the ZOC in an Environmental Impact Statement (EIS) would authorize wildland fire use in that area.

Each alternative was analyzed for its environmental effects on the ten impact topics. The topics are: life and property, visitor experience, tourism, cultural resources, vegetation, wildlife, unique sites and wilderness, erosion/debris flow, and air quality. The activities and stakeholders in Alternative B's ZOC on USFS land are discussed under each of these topics.

Alternative B is the environmentally and NPS preferred alternative. Allowing low to moderate- intensity fire to burn over more areas under Alternative B may ultimately reduce the risk of large- scale, high- intensity fires to a greater degree than the other alternatives. Alternative B is the most sustainable approach over the long- term, bringing the greatest ecological benefits and reducing risk. Expanding burnable area and flexibility of burn conditions moves resources to more routine fire events rather than forcing the investment at resources in high cost suppression of widespread, high-intensity fires. Local fire history is well established— a number of tree ring studies show widespread fires were frequent events in the Chiricahua Mountains in pre- European settlement times. Fire management strategies employed at Chiricahua National Monument would result in some short- term minor adverse effects, such as inconvenience to visitors, discouragement of tourists, disturbance to cultural resources, death of individual plants and animals and disruption of their habitats, changes to the character of unique sites and wilderness, increase in erosion, and degradation of air quality. Long- term benefits, such as reduction of fire hazard, aid to reproduction in fire- tolerant plant species, and renewal of habitats are predicted to outweigh short-term losses in the fire- adapted systems at the monument.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Chiricahua National Monument is located in the Chiricahua Mountains in the southeast corner of Arizona (Figure I- 1). Unique geological formations prompted the establishment of the monument in 1924, but its ecological riches have also gained fame over the years. Most of the 11,985- acre monument is designated wilderness. Other park features are shown in Figure I- 2.

Purpose for Action

The purpose of the proposed action is to implement an improved fire management plan (FMP) at Chiricahua National Monument. The National Park Service can review FMPs annually and change them at that time, but are required to update them every five years. The 1992 plan is being updated to incorporate advances in fire knowledge, results of burning and monitoring programs at the monument, and revisions in park service policy. The FMP guides all aspects of a park's fire program. The National Park Service goal of FMP updates at 5- year intervals acknowledges the rapidly changing fire context in parks. Ecologists are increasing our understanding of the role of fire in biotic communities. Fire scientists are learning more about fire behavior as fire- fighting techniques also improve. Policies have been rewritten to incorporate these advances as well as to respond to growing concern at many levels about the legacy of the fire suppression era—infrequent high- intensity, widespread events instead of the frequent, low- intensity fires that were part of the ecosystem in most of Chiricahua National Monument's vegetation communities.

Need for Action

Tree ring studies in woodland and forest vegetation types show widespread fires were once frequent events in the Chiricahua Mountains; the fire season takes place annually with the onset of a summer monsoon season and accompanying lightning. Twentieth-century fire suppression is suspected to have altered plant communities, and it is logical to expect that changes in structure and composition of vegetation would have affected animals. Fuels have accumulated in the absence of fire.

In the 1970s, Chiricahua National Monument staff recognized ecological changes resulting from decades of little or no fire. They began experimental burning to assess ecological effects and develop burn prescriptions. The first FMP was completed in 1982 and directed the park to manage fire in three fire management units (FMUs) (NPS 1982). The Natural FMU, roughly 2,000 acres in the park's center, allowed natural fires to burn unless they threatened people, structures, or habitat for threatened and endangered species. About 7400 acres comprised a Conditional FMU, where natural fires burned or were suppressed under predetermined prescriptions, and prescribed fires were lit to achieve ecological and hazard- reduction objectives. Natural fires were suppressed and prescribed fires applied in an 800- acre Suppression- Prescribed Fire FMU.

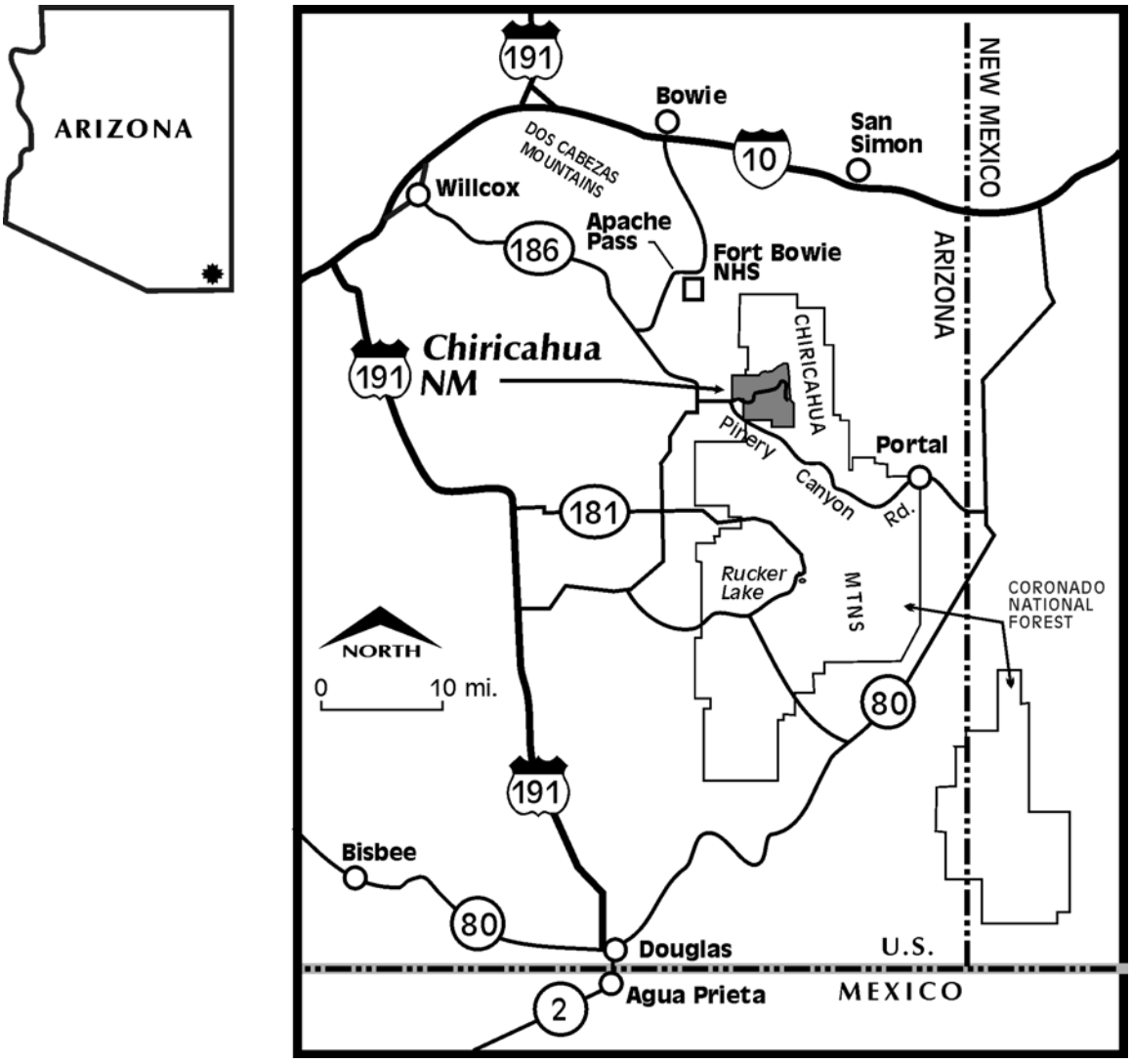

Figure I- 1. Location of Chiricahua National Monument

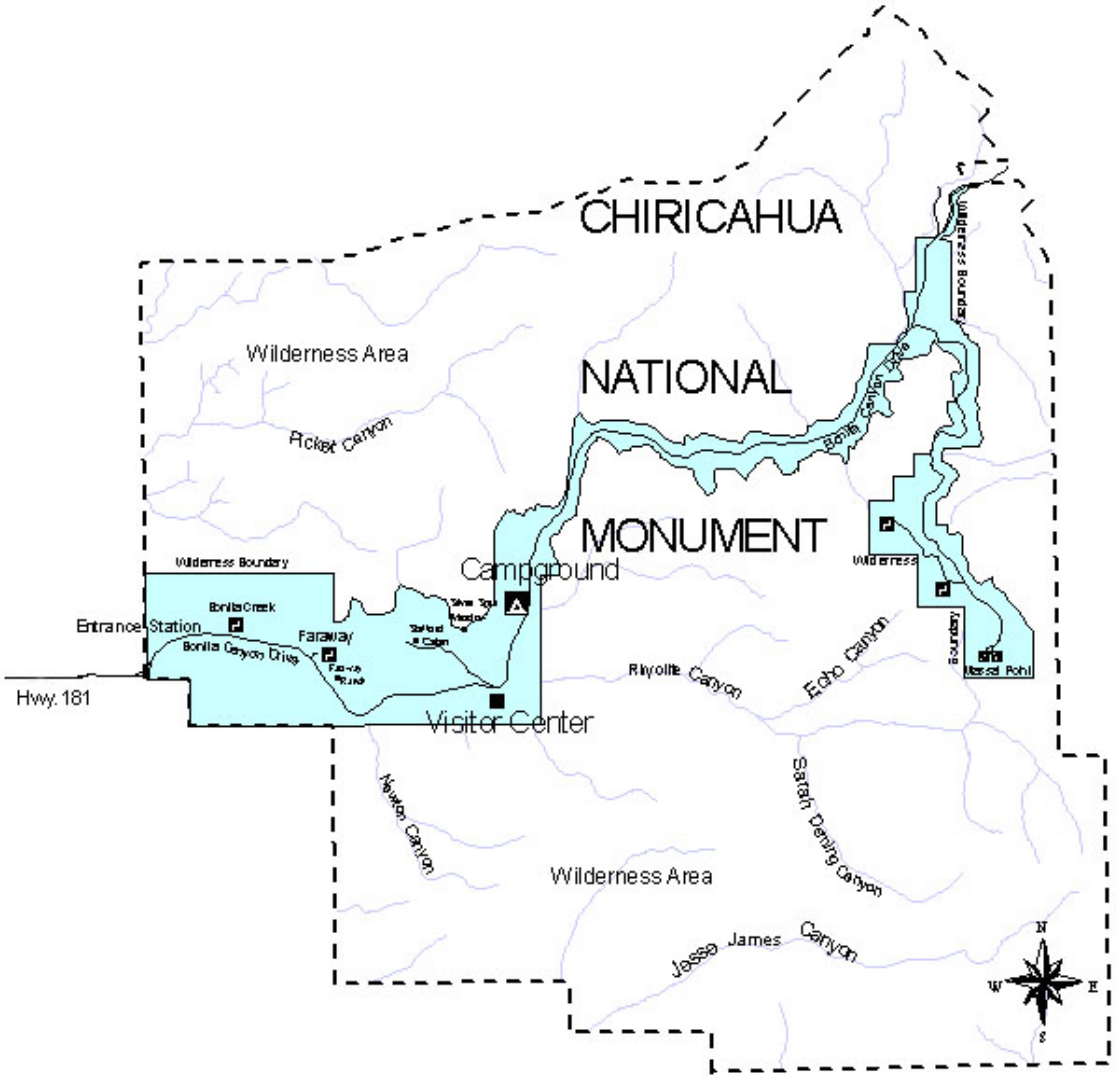

Figure I- 2. Park Features Map

The 1992 FMP presented two fire management units for the monument. This "donut" plan maintained an area in the center of the park that allowed wildland fire use (formerly called prescribed natural fire). Wildland fire use involves allowing naturally-caused wildland fires to burn under certain conditions in order to achieve management goals. A suppression zone completely surrounded the first unit and extended to the park boundary in every direction. Prescribed fire was allowed in both FMUs. Prescribed fire is a fire that is intentionally set by park staff or other qualified personnel in order to achieve some specific goal. This strategy aimed to restore natural ecological processes in a core area of the park while (1) keeping fire from spreading to neighboring USFS and private lands, and (2) protecting life and property in high- use and historic areas.

The need for this current action is to develop an updated fire management plan for Chiricahua National Monument, in order to comply with NPS *Director's Order #18: Wildland Fire Management* (DO- 18 1998). DO- 18 states that "each park with vegetation capable of burning will prepare a fire management plan to guide a fire management program that is responsive to the park's natural and cultural resource objectives and to safety considerations for park visitors, employees, and developed facilities." The completion of this FMP will satisfy these requirements. This plan and the associated EIS will establish future management direction for fire- related activities at Chiricahua National Monument by analyzing a range of alternatives and strategies. The need to manage fire—both to maximize its benefits and minimize its dangers— continues at the monument.

The preparation of an EIS rather than Environmental Assessment acknowledges the potential for the fire program to result in significant environmental effects or controversy. The monument is using fire to generate significant beneficial effects on the landscape over time. This management direction must be considered against a backdrop of (1) recent large fires in the state of Arizona judged to be outside the normal range of variability in severity, (2) an escaped prescribed fire (an 8- acre fire that grew to 200 acres) at the monument in 1997, and (3) the 1994 Rattlesnake fire in the Chiricahuas south of the monument that burned 27,500 acres and resulted in massive amounts of erosion and the burying of a popular reservoir.

Regulations, Policies, and Plans

The National Park Service recognizes the occurrence as well as the absence of fire as integral factors influencing parks. Fire management policies are set forth in section 4.5 of 2001 Management Policies (NPS 2001) and are summarized below:

- Fire management programs will meet resource management objectives while ensuring protection of life and property.
- Parks with vegetation capable of burning will prepare FMPs and address funding and staffing required by fire programs.

- Fire plan development will include the National Environmental Policy Act (NEPA) compliance process and necessary collaborations with outside parties.
- Fires in vegetation are to be classified as wildland or prescribed fires.
- Wildland fires are managed according to considerations of resource values, safety, and cost.
- Prescribed fires are ignited to achieve resource management goals and closely monitored to determine whether they successfully meet objectives.
- Parks lacking approved plans must suppress all wildland fires using Appropriate Management Response that includes methods that are the most cost effective while causing the least impact.
- Suppression in wilderness will be consistent with the "minimum requirement" concept.

Many other plans and policies direct the formulation of the FMP and the environmental analysis that supports it:

- Archaeological Resources Protection Act (1979) – provides for the protection of archeological resources on public lands
- American Indian Religious Freedom Act (1978) – protects access to sites, use and possession of sacred objects and freedom to worship through ceremonials and traditional sites
- Chiricahua National Monument General Management Plan (NPS 2001) – determines overall management direction for the monument for 12 to 15 years
- Chiricahua National Monument Natural and Cultural Resources Management Plan (NPS 1996) – sets natural and cultural resources management and research priorities
- Clean Air Act (as amended 1990) – includes national ambient air quality criteria; states that federal land managers have an affirmative responsibility to protect air quality related values from adverse impacts
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10- Year Comprehensive Strategy Implementation Plan (National Interagency Fire Center 2002) – a strategy for reducing wildfire risks and improving collaboration with affected agencies and parties.
- Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making (NPS 2001) – interprets the National Environmental Policy Act for the National Park Service
- Director's Order 18: Wildland Fire Management: (NPS 1998) – expresses NPS fire policy
- Endangered Species Act (1973) – provides for listing and protection of endangered and threatened species and their critical habitat; requires consultation under Section 7 if any listed species may be adversely affected
- Executive Order 11988: Floodplain Management (1977) – provides for the protection of floodplains

- Executive Order 11990: Wetlands Protection (1977) – provides for the protection of wetlands
- Federal Water Pollution Control Act (1972; amended as "Clean Water Act" in 1977)- limits discharges into US waters to maintain water quality
- Federal Wildland Fire Management Policy (1995) Review and Update (National Interagency Fire Center 2001) – provides a common approach to wildland fire management for U.S. Department of Interior agencies and the USFS
- Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems—A Cohesive Strategy (USDOI/USDA 2002) – provides an approach for protecting communities in rural areas from wildfires
- National Fire Plan (2001) – manages the impact of wildfires on communities and the environment
- National Parks and Recreation Act (1978) – requires park management to provide measures for the preservation of the area's resources, consider how development affects public enjoyment, identify visitor carrying capacity, and propose any changes to boundaries
- National Park Service Organic Act (1916) - defines NPS management responsibilities as conserving scenery, natural and historic objects, and wildlife to provide for the enjoyment of future generations
- Natural Resources Management (NPS 1989a) - guides management for resource values in the parks
- National Environmental Policy Act (1969) - requires federal agencies to consider environmental values and integrate them into their proposed actions (abbreviated as NEPA).
- National Historic Preservation Act (1966) – guides preservation of historic properties
- Native American Graves Protection and Repatriation Act (NAGPRA 1990) – provides a process for museums and federal agencies to return certain Native American cultural items to their descendants and affiliated tribes
- Wildland Fire Management Reference Manual 18 (2001) – contains NPS wildland fire management requirements and procedures
- Reference Manual 77 (NPS 1999 and in progress) – offers comprehensive guidance to National Park Service employees responsible for managing, preserving, and protecting the natural resources found in National Park System units

General Management Plan (GMP) and Resource Management Plan (RMP) Objectives

Implementation of a new FMP helps the park meet some resources objectives listed in the General Management Plan (NPS 2001) and the Natural and Cultural Resources Management Plan (NPS 1996). This fire plan tiers off of the GMP and addresses the perpetuation of native species and communities, protection of cultural resources, human safety, interpretation, and enactment of NPS philosophies and policies. In

addition, the FMP is a detailed program of action to carry out fire management policies and objectives.

General Management Plan Objectives
The 2001 General Management Plan discusses specific fire- related objectives. Implementing the GMP calls for safer operation of the fire program, especially relocating a combined park headquarters and visitor center away from its current wooded, shrubby site. Upgrading roads and the water system have improved access and suppression capabilities. Continuing a prescribed fire program would help return vegetation to its historic less dense, more mosaic- like structure in many locations and reduce fuel loads where fire could threaten structures. Joint planning with the USFS would help facilitate use of fire in the wilderness, as would explaining the natural role of fire in interpretive materials.

Resources Management Plan Objectives
Management objectives stated in the Natural and Cultural Resources Management Plan include the following objectives relevant to the fire program:

- to identify, protect, and perpetuate the geological formations, flora, fauna, and wilderness values
- to preserve and manage lands designated as wilderness
- to manage fire as a natural process affecting ecological resource conditions in the monument in cooperation with the USFS
- to work with outside agencies and landowners to eliminate adverse impacts to monument resources
- to restore natural qualities to impacted sites within the monument
- to preserve the scenic qualities of the monument
- to protect and preserve air quality related values
- to develop a baseline of air quality information and provide an early warning detection of air quality impacts
- to identify, preserve, and interpret the aspects of human activities and events
- to seek and gather objects and information which have significance to the monument's cultural resources

Parties to the Plan
Eight broad groups of people prepared the fire management plan/DEIS.

- *Inter- Disciplinary Team* (IDT): The IDT is composed primarily of individuals from the park who are ultimately responsible for carrying out the plan. The team includes expertise in natural and cultural resources, fire operations, park administration, and visitor services. The Chiricahua team also includes a partner from the University of Arizona who served as overall editor for the plan and DEIS. The team first met for at an internal scoping meeting in October 2001.

- *USDA Forest Service:* The Douglas Ranger District of the Coronado National Forest, the monument's neighbor to the north, east, and south, is a collaborating agency for the DEIS.
- *U.S. Fish and Wildlife Service:* NPS received a species list from the Arizona Ecological Services Office on 1- 30- 02. A Biological Assessment was prepared addressing these species. Summary conclusions appear in Appendix II in write- ups for the species addressed in the document. The Service issued a Biological Opinion on July 23, 2004.
- *Arizona Department of Game and Fish*: In addition to consideration of effects of federally listed sensitive species, the Department of Fish and Game was contacted to determine the presence of state listed species on April 8, 2002.
- *State Historic Preservation Office:* Plan development included consultation with the Arizona State Historical Preservation Office (SHPO) and NPS archeologists at the Southern Arizona Office and Western Archeological Conservation Center on cultural resources. An FMP Cultural Resources Component was submitted to the SHPO in lieu of the entire DEIS on March 19, 2003 and was found in compliance with Section 106 obligations on May 1, 2003.
- *Tribal Governments:* The monument's Chief of Resources Management provided details of the proposed action and fire planning process to affiliated tribes by letter—Fort Sill Apache, Mescalero Apache, San Carlos Apache, White Mountain Apache, and Hopi. We received written comments from the White Mountain Apache Tribe and the Hopi Tribe prior to the release of the DEIS; comments were considered in preparation of the DEIS released to the public. This information was sent to the Arizona SHPO on March 17, 2003; a letter of concurrence was received from the Arizona SHPO on May 1, 2003.
- *Outside Reviewers:* Several individuals from the Coronado National Forest Douglas Ranger District and Supervisor's Office reviewed the DEIS in internal draft form. Superintendents Ellis Richard (Guadalupe Mountains National Park), and Dale Thompson (Coronado National Memorial) served as National Park Service peer reviewers.
- *Interested Public:* The monument mailed a scoping newsletter to a list of neighbors, affected agencies, and other interested parties. The newsletter outlined the results of the internal scoping meeting and invited recipients to public meetings held near the park. The written comments of people who attended two public scoping meetings (February 21 in Portal, AZ and February 22, 2002 in Willcox, AZ), neighbors, and other interested members of the public have been considered during the development of the DEIS; all parties who commented during the scoping will be notified when the DEIS is available for comment.

Goals and Objectives

The IDT began developing FMP goals and objectives at its October 17–18, 2001 meeting at the monument, and subsequently added to and refined them. Team members identified the following goals and objectives.

Goal 1: Protect life, property, and resources from the unacceptable effects of unwanted wildfires and from fire management activities by providing for safe, aggressive suppression of wildfires using Appropriate Management Response (AMR).

Objectives:

- Provide for the safety of visitors, park employees, and the fire- fighting team as the first priority.
- Ensure that fire personnel meet National Wildfire Coordinating Group qualifications when appropriate.
- Reduce fuels that could adversely affect park developments, cultural resources, and ecologically sensitive areas using prescribed fire and mechanical fuel reduction.
- Assign a resource advisor to any fire with the potential to adversely affect sensitive resources.
- Minimize unacceptable effects of wildland fire suppression on natural and cultural resources through burned area rehabilitation, when appropriate.
- Develop burn prescriptions and objectives that minimize unacceptable effects of prescribed fire on natural and cultural resources.

Goal 2: Reintroduce fire as a natural process in park ecosystems by allowing selected wildland fires to burn.

Objectives:

- Maintain species diversity and natural patterns of succession.
- Improve habitat of sensitive species when appropriate to achieve with fire management actions.

Goal 3: Apply fire to accomplish desired resource management objectives.
Objectives:

- Maintain species diversity and natural patterns of succession.
- Improve habitat of sensitive species.
- Control exotic species.
- Restore or improve watershed values.
- Restore or maintain the historic scene.
- Meet federal, state, and local air quality regulations.

Goal 4: Base the fire program on sound data obtained through scientific investigations and monitoring.

Objectives:

- Determine questions relating to fire and protection of cultural and natural resources.
- Conduct studies and acquire information.
- Incorporate results into resource management planning and execution.

Goal 5: Integrate fire program concerns into activities of all park divisions.

Objectives:

- Openly communicate about fire activities with all park divisions.
- Incorporate fire management tasks into all park divisions.
- Keep the public informed about park fire operations.

Goal 6: Manage fire cooperatively with adjacent land management agencies and private landowners.

Objectives:
- Hold fire planning sessions with neighboring land managers.
- Keep inter- agency agreements current and continue collaborating on joint fire-management projects.
- Keep neighbors informed about park fire operations.

Impact Topics
Specialists in the National Park Service and the University of Arizona on the IDT identified impacts and concerns affecting the proposed fire program actions. NEPA requires consideration of a specific list of mandatory topics. Table I- 1 lists these topics and how they apply to Chiricahua National Monument. Those topics that do not apply to the monument have been identified in the table and dismissed from further consideration in this DEIS. This DEIS also considers topics listed on the NPS Intermountain Region Environmental Screening Form (ESF). These topics cover four broad areas: human interaction and experience, natural resources, cultural resources, and federal and state policies. The IDT's inventory of issues, concerns, and opportunities that relate to ESF entries is listed in Appendix I. From this extensive list, the IDT identified eight topics critical to fire program activities at Chiricahua National Monument.

Safety of humans and the protection of property are the first priority of the fire program (impact topic 1). The monument exists to provide a range of educational and recreational opportunities to the local and traveling public, making visitor experience and the local businesses relying on tourism a key consideration (impact topic 2). Visitors are also drawn to the park's historic sites and landscapes. These cultural resources must be considered when managing for fire (impact topic 3). The monument's botanical diversity and special plant communities (impact topic 4), as well as wildlife found in few other NPS units (impact topic 5), have the potential to both benefit and suffer from fire. Visitors also value the wilderness opportunities and unique park features (impact topic 6). Soil, slope and vegetation conditions in the monument predispose the area to runoff when intense rain follows widespread fire, making erosion and debris flow essential to consider (impact topic 7). Proposed fire management Alternatives A and B increase the potential for more wildland fires across the monument, which could temporarily degrade air quality (impact topic 8).

Table I- 1. NEPA Mandatory Topics

Impact Topic	Status in this Document
Plans and Policies	Relevant plans and policies are listed above in Chapter I.
Energy Requirements and Conservation	Vehicle use to support fire management activities consumes fuel. A return to more natural fire processes saves resources consumed fighting fire. Because energy consumption is not a factor that affects selection of fire management strategies, the impact topic was dismissed from further consideration.
Consumption of Natural or Depletable Resources, and Conservation Potential	Fire and fire management activities consume renewable natural resources such as vegetation and water and non- renewable vehicle fuel. Consumption of vegetation is discussed under all impact topics. Because consumption of other resources is not a factor that affects selection of fire management strategies, the rest of this impact topic was dismissed from further consideration.
Urban Quality	Chiricahua National Monument is located in a rural area. Therefore this impact topic was dismissed from further consideration.
Socially or Economically Disadvantaged Populations	Fire management actions must consider impacts to humans (Goal 1). There are no impacts predicted to fall predominantly upon disadvantaged populations. Chiricahua National Monument is located in a sparsely populated rural area. Therefore, this impact topic was dismissed from further consideration.
Wetlands and Floodplains	Two significant drainages exist within the park, Bonita and Rhyolite Creeks. NPS is required to address effects of fire management on floodplains (E.O. 11988). Springs are unique features which occur within the park. These wetland resources will be addressed under Impact Topic #6 (Unique Sites and Wilderness). Fire can alter hydrologic processes that may affect erosion and flooding potential; this possibility is addressed under Impact Topic #7 (Erosion/Debris Flow) in this DEIS.

Prime and Unique Agricultural Lands	This impact topic was dismissed because these lands are not found within or adjacent to the monument, according to the Natural Resources Conservation Service.
Federally Listed Species	The monument has consulted with U.S. Fish and Wildlife Service on a new FMP, prepared a Biological Assessment that analyzes effects on five species, and received a Biological Opinion on July 23, 2004. In this DEIS, Chapter III provides background and Chapter IV summarizes the BA's analysis. Please refer to Impact Topic #4 (Vegetation) and Impact Topic #5 (Wildlife).
Important Cultural Resources	This feature falls under the cultural resources impact topic in this DEIS. The monument has produced a Cultural Resources Component (CRC) analyzing cultural issues and received concurrence from the SHPO. In this DEIS, Chapter III provides background and Chapter IV summarizes the CRC's analysis; the summary matrix from the CRC is attached to this DEIS as Appendix VII. Five affiliated tribes with historical and/or contemporary ties to the monument were consulted. Please refer to Impact Topic #3 (Cultural Resources). No formal determinations have been made on ethnographic resources or Traditional Cultural Properties (TCPs). An Ethnographic Study is currently underway for Chiricahua National Monument and Fort Bowie. Therefore, ethnographic resources and TCPs have been eliminated from further consideration in this DEIS.
Ecologically Critical Areas	Such areas are addressed under the natural resources impact topic in this DEIS. Please refer to Impact Topic #4 (Vegetation) and Impact Topic #5 (Wildlife).
Public Health and Safety	These highest priority concerns are addressed under Impact Topic #1 (Life and Property) in this DEIS.
Sacred Sites	This area is addressed under the cultural resources impact topic in this DEIS. Please refer to Impact Topic #3 (Cultural Resources).
Indian Trust Resources	This impact topic was dismissed because these resources are not found at the monument.

The impact topics and key associated issues are listed below:

Impact Topic 1 (Life and Property)
Fire is an effective tool for reducing hazard fuels, but it is also a threat to the public, firefighters, park staff, and developed areas.

Impact Topic 2 (Visitor Experience and Tourism)
Potential restrictions on access to burning areas, road closures, traffic, and smoke can alter visitor experience and cause tourists to avoid the area; but the fire program also provides interpretive opportunities.

Impact Topic 3 (Cultural Resources)
Fire may help reduce surrounding hazard fuels and maintain the historic scene, but historic structures, landscapes, and artifacts may incur fire damage.

Impact Topic 4 (Vegetation)
Fire will benefit many species in the long- term but may kill and injure some plants in the short- term.

Impact Topic 5 (Wildlife)
Fire will benefit many species in the long- term but may kill and injure some animals in the short- term.

Imp**act Topic 6 (Unique Sites and Wilderness)**
Fire may change the character of unique natural sites and wilderness in the park.

Impact Topic 7 (Erosion/Debris Flow)
Fire can remove vegetation from slopes and cause increased erosion until plants regrow.

Impact Topic 8 (Air Quality)
Smoke from fires can be unhealthy, a regulatory problem, and obscure views.

The affected environment described in Chapter III focuses on Chiricahua National Monument features that pertain to these impact topics and issues.

Chapter II: Alternatives

Fire management alternatives are proposed ways to satisfy park need, purpose, goals, and objectives. This chapter of the DEIS presents the range of alternatives developed by the interdisciplinary team, describes the alternatives considered likely to meet goals and objectives, and justifies the exclusion of the other alternatives. The Chiricahua IDT put together FMP alternatives after considering NPS policies, park fire history, fire literature, results of the existing fire program, experiences and expertise of team members, and ideas expressed during the scoping process. The short list of alternatives and ultimately the preferred alternative were derived by the IDT through application of ecological, safety- related, administrative, logistic, and economic criteria. Public meeting input led to the development of Alternative B's cooperative watershed approach.

Resource Analysis
Chapter III describes the environmental context for the alternatives introduced in this chapter. Fire history, fire ecology, and prescribed burn program results are summarized here. This background is needed to understand the historic fire frequency in the park and the potential impacts of the fire management alternatives.

Fire History and Ecology
Work at Chiricahua National Monument and elsewhere in the Chiricahua Mountains by the University of Arizona Laboratory of Tree- Ring Research suggests fire was a frequent and widespread event prior to the 20th century. Data show that the frequency, extent, and severity of presettlement fires varied among vegetation types. In the 17th through 19th centuries, low- intensity surface fires burned canyon- bottom oak- pine forests every 13 years on average (Swetnam et al. 1989; Baisan and Morino 1999). These fires killed seedlings and saplings and maintained low tree density in oak- pine stands (Barton 1996). Fires burned less frequently in upland chaparral (around every 30–100 years) and pinyon- juniper- cypress woodlands (around every 200 years), but these were intense fires that severely thinned and killed shrubs or trees within burns (Baisan and Morino 1999). Kaib et al. (1996) propose that fires occurred in grasslands at the foot of the mountain range every 4 to 8 years before the 20th century.

The mixed regime of presettlement fires—irregular in time and intensity—is probably a major contributor to the high species diversity in the Chiricahuas and the highly varied patterns of vegetation distribution across the landscape. Beginning in the late 19th century, the number of fires recorded in the park dropped dramatically, most likely due to (1) depletion of fuels by timber cutting and grazing and (2) federally dictated fire suppression starting in the early 20th century. Consequently, bottomland oak- pine forests have become more dense, woody species have invaded grasslands, and fire-intolerant species have increased (Swetnam et al. 1989; Baisan and Morino 1999; Barton 1999).

Elements Common to All Alternatives

Appropriate Management Response

Automatic suppression of all wildland fires is no longer the rule in national parks. "Appropriate management response" in fire operations jargon refers to specific actions taken in response to a wildland fire to meet protection and fire use objectives. Under all the reasonable alternatives, the appropriate management response is developed from analysis of the local situation, values- to- be- protected, management objectives, external concerns, and land use. Suppression or containment of a fire in a larger area could be appropriate management responses. The NPS would continue to suppress all human-caused (non- prescribed) fires in a manner that causes the least damage to resources, people, and property. All wildland fires would be monitored daily or more frequently in accordance with the Western Region Fire Monitoring Handbook and the Wildland Fire Situation Analysis. The park will continuously update information on fire size, location, behavior, smoke dispersal, safety conditions, and effects.

Prescribed Fire Program

Managers at the monument grew interested in re- establishing fire as one of the natural processes maintaining park ecosystems in the 1970s. They also recognized that carefully managed fires could reduce fuels built up around valuable cultural and natural resources and help protect them from destructive wildfires. As shown in Table II- 1, the park has carried out 41 burns covering 3,927 acres in all four of the vegetation types used for fire management (and described in more detail in Chapter III).

Table II- 2 describes qualitative objectives of the prescribed fire program under all the reasonable alternatives discussed below. Table II- 3 is a schedule of proposed burns that also briefly describes the purpose of each burn; Figure II- 1 is the associated map. These burns range in size from 30 to 1,000 acres. The park acknowledges that multiple burns will be needed to recreate the conditions that allow wildland fire to play its natural role. Lessons from past burns continue to be incorporated into the planning for future burns.

Non- fire Fuels Treatments

Under all alternatives, the park may use non- fire means to reduce fuel loads and create fuel breaks around developments. To date, 50- 75% of fuel has been mechanically and manually removed within 200 ft around 13 houses near headquarters with slash burned to dispose of it. Additionally, one- third of the biomass in a 60- acre block downhill of the developed area has been removed to slow any incoming fire. In all, treatment has covered about 32 acres. The amount of future clearing depends on the resources needing protection and the amount and type of surrounding vegetation. Current plans call for very little non- fire treatment in the near future: using chainsaws to thin 2 acres of oak woodland behind the housing area and 1 acre near the campground, and burning the slash piles. An area near Headquarters and Faraway Ranch has been used for burning slash piles on several occasions, but they have been burned in other places as well when moving the slash to this area is not logistically feasible.

Table II- 1. Prescribed Burns through 2003 at Chiricahua National Monument

Vegetation type abbreviations are as follows:

G = mixed grasses with minor shrub- tree component
O = mixed oaks
P = pine with mixed conifers and hardwoods
M = manzanita shrub community

Burn Complex	Burn Unit	Veg Types	Acres Burned	Year
Faraway	Faraway I	G	2	1975
Faraway	Faraway	G	4	1975
NW	Picket Park #1	O, P	10	1980
HQ	Rhyolite	O, P	15	1980
NW	Picket #2	O, P	10	1981
HQ	Rhyolite #2	O, P	65	1981
HQ	Rhyolite #3	O, P	80	1982
Highlands	Inspiration Point	O, P	150	1983
HQ	Meadow Woods	O, P	50	1984
NW	NW Corner	G, M	200	1986
HQ	Rhyolite T	M, O, P	10	1986
HQ	Meadow Woods #2	O, P	8	1987
Faraway	West Faraway #1	G	10	1987
HQ	Massai	O, P	10	1990
Faraway	West Faraway	G	9.2	1990
HQ	Powerline I	P, O	5	1991
HQ	Rhyolite I	O, P	20	1992
HQ	Silveredge	P, O	13.2	1992
HQ	Rhyolite	P, O	2	1992
HQ	Residence HQ #2	P, O	5	1992
HQ	Silver Spur	G	4	1993
HQ	HQ/Rhyolite #4	P, O	8	1993
Highlands	Sugarloaf	G, M	15	1993
Faraway	Faraway #3	G	4	1993
Faraway	West Faraway #4a	G	6	1993
HQ	HQ/Wedge	P, O, M	2	1995
Highlands	Echo #1	P	69	1996
Whitetail	Bonita #1	P, O	10	1997
HQ	Wedge	M	5	1998
HQ	Headquarters (reburn)	O	5	1998
South	Newton	G, M, O	800	1998
NW	Little Niagara	O, M, G	540	1999
HQ	Wedge	M	2	1999
HQ	Powerline II (reburn)	P, O	25	1999
HQ	Headquarters	O	10	1999
South	Newton	G, M, O	125	1999
HQ	Silver Spur	G	5	2001
NW	Picket Park	O, P	500	2002
HQ	Wedge	M	35	2002
NW	Little Picket	O, M, G	782	2003
HQ	Madrone	O, M	297	2003

Table II- 2. Objectives of Prescribed Fire and Wildland Fire Use by Vegetation Type

Pine with Mixed Conifer and Hardwoods	Mixed Oak Community	Manzanita Shrub Community	Mixed Grasses with Minor Shrub/Tree Component
Reduce live pole-sized tree density	Reduce live pole-sized tree density	Immediately reduce shrub cover	Increase percent cover of native grasses and forbs
Reduce dead and down fuel loadings	Reduce live overstory tree density	Maintain reduced shrub cover for 5 years	Prevent spread of non- native plant species
Reduce live overstory tree density	Increase percent cover of native perennial grasses and forbs	Increase cover of native grasses and forbs	Reduce density of woody invasive species
Reduce manzanita cover	Reduce manzanita cover		
Reduce litter fuel loadings	Reduce dead and down fuel loadings		
Increase cover of native grasses and forbs	Prevent spread of non- native plant species		
	Reduce litter fuel loadings		

Table II- 3. Proposed Prescribed Fire Projects 2004- 2011

Complexes and burn units are shown on Figure II- 3.
MSO PAC = Mexican spotted owl protected activity center.
Vegetation Types: G=Mixed grassland, M=Manzanita shrub, O=Oak woodland, P=Mixed conifers and hardwoods
Condition Class: 1 = Fire regimes within historical range, 2 = Fire regimes moderately altered from their historical range*, 3= Fire regimes significantly altered from their historical range
S^a indicates manzanita type (M) in this unit will likely remain shrubland after burning.
G^b indicates manzanita type (M) in this unit will likely convert to grassland after burning.
Grassland type (G^c) in this unit is a mosaic of native patches and Lehmann lovegrass stands.

Complex	Burn Unit	Veg Types	Condition Class	Acres Burned (proposed)	Year	Purpose of Project
Whitetail	Massai Saddle	P, O, M	2 (S^a)	(300)	2004	Conduct first burn in area with long (unknown) interval since last fire
South	Hand's Pass	M, P	2 (S^a)	(1,000)	2004	Restore historical frequent fire interval to pines in drainage. Manzanita type in this burn unit will likely remain shrubland.
HQ	Lower Rhyolite (LR)	O, P	2	(30)	2005	Reduce fuels to protect canyon-bottom developments; reduce overstocked oak stand densities
Whitetail	East Whitetail	M, O	2 (S^a)	(800)	2007	Cooperative project with USFS for restoring historical frequent fire interval to pines in drainage
Highlands	Echo Park	P	2	(110)	2007	Conduct low- intensity burn for MSO PAC maintenance

Whitetail	Shake Spring	M, P, O	2 (S^a)	(400)	2008	Conduct low- intensity burn for MSO PAC maintenance
Faraway	South Slope	G, M	2 (G^b)	(50)	2008	Reduce fuels to protect canyon-bottom developments and historic structures
Highlands	Upper Rhyolite	P, O	2	(200)	2009	Restore historical frequent fire interval; thin overstocked oaks
South	Jesse James	P, O, M	2 (G^b at lower elev; S^a at higher)	(500)	2009	Open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands
HQ	Rhyolite # 5 (R5)	O, P	2	(50)	2010	Reduce fuels to protect canyon-bottom developments; thin overstocked oak stands
Highlands	Inspiration Point	P, O	2	(150)	2010	Reburn for restoring historical frequent fire regime
Highlands	Echo Park	P	2	(110)	2011	Conduct low- intensity burn for MSO PAC maintenance
South	Little Jesse James	P, O, M	2 (G^b at lower elev; S^a at higher)	(500)	2011	Open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands
Faraway	North Slope	G^c, M	2 (G^b)	(50)	2012	Research burn to look at Lehmann lovegrass response (see Vegetation section in Chapter III)

* *Detailed definition of Condition Class 2*:
Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Wildland fires burning in Condition Class 2 lands can have moderately negative impacts to species composition, soil conditions, and hydrological processes.

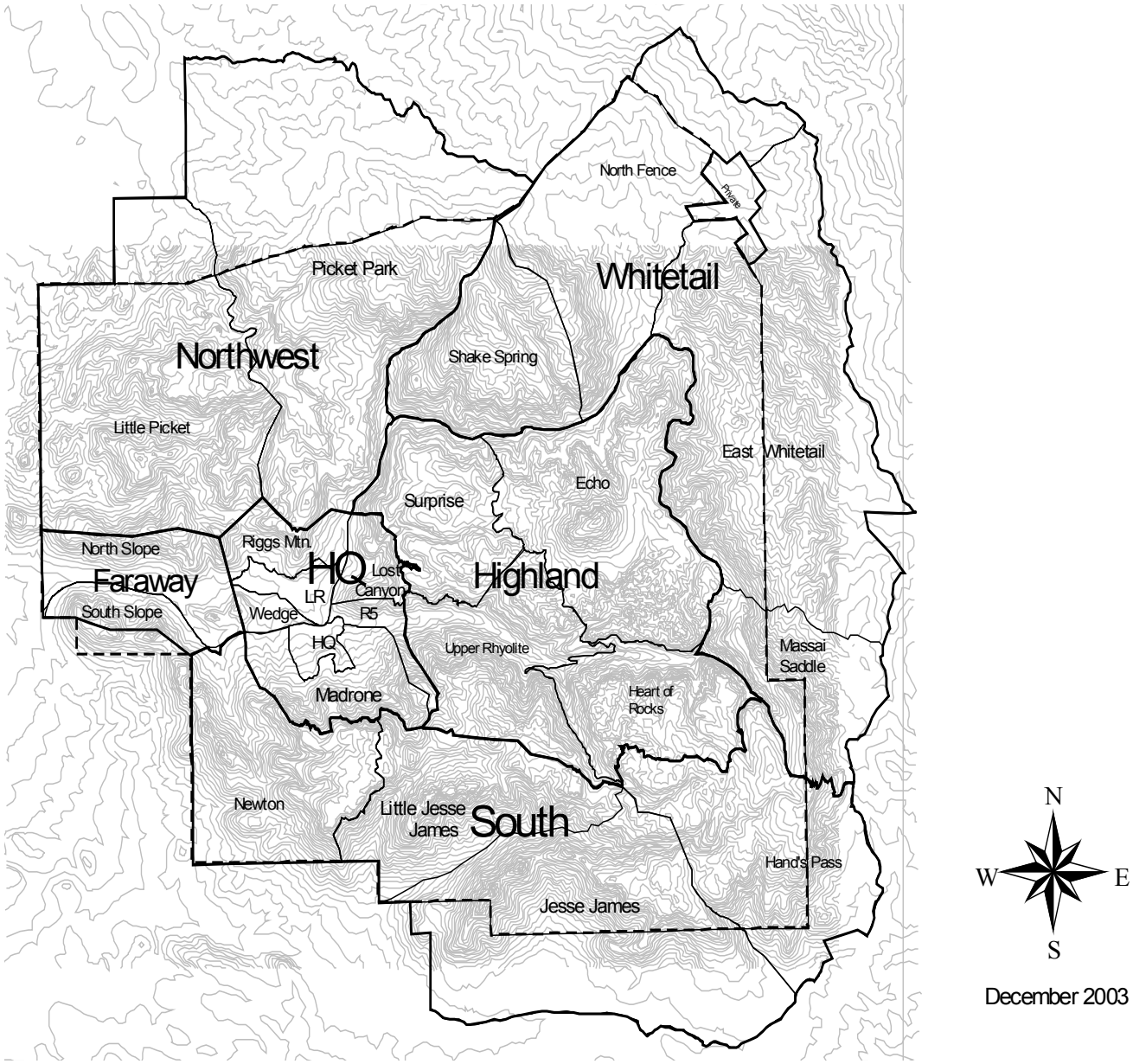

Figure II- 1. Burn Complexes and Units.
For No Action Alternative A, units would stop at the monument boundary (heavy dashed line). Area between heavy dashed line and lighter solid line is Alternative B's Zone of Cooperation with the Coronado National Forest. Burn units extend beyond the north, east, and south park boundaries onto the Coronado National Forest for Alternative B.

Wildland Fire Use

Fire managers have also embraced the idea of letting naturally ignited fires burn if they (1) satisfy safety and logistical criteria and (2) meet the objectives appearing in Table II- 2 and Table II- 3 (for ignitions in particular burn units). These objectives also apply to all the reasonable alternatives. In the past 10 years, a single natural ignition with the potential to yield desired resource benefits occurred in the monument, but its location just outside the wildland fire use FMU required that it be suppressed. Fire use events may burn larger than prescribed fires, but must remain within predetermined prescriptions.

Mitigation of Undesirable Effects

The monument would continue reasonable efforts to avoid, minimize, and mitigate the negative effects of the fire program. All alternatives considered in this analysis will be implemented using appropriate mitigation and best management practices in order to offset adverse impacts to human, natural, and cultural resources. The following measures will be followed in implementing the alternatives carried forward and should be considered as part of the alternatives for purposes of impact analysis. The mitigation measures below are organized by resource area.

Safety, Visitor Experience, and Socioeconomics

- Educate and notify monument neighbors, park visitors, and local residents of all planned and unplanned fire management activities that have the potential to impact them.
- Minimize visitor exposure with onsite protective measures. Similarly, avoid prescribed burns during periods of high visitation.
- Reduce fuels with thinning, buffers, and fire breaks.
- Use suppression near buildings and other sensitive areas. Employ "Minimum Impact Suppression Tactics" when possible.
- Coordinate with local land managers to minimize cumulative impacts on region.

Special Status Species and the Natural Environment

- Consult park resource managers when making decisions about wildland fire use.
- Notify a park resource manager if sensitive species are discovered during fire operations. Fire crew members will neither approach nor harass any such animals they find.
- Implement any fuels management programs whenever possible outside the breeding season of the Mexican spotted owl.
- Minimize heat impacts to special status species (Mexican spotted owl and lesser long- nosed bat), their nest sites, and the Palmer agave food source for bats.
- Monitor agaves so that there is no more than 20% Palmer agave mortality in a burn area five years postburn.
- Follow Mexican spotted owl Recovery Plan guidelines in setting project objectives.
- Continue to survey known Mexican spotted owl Protected Area Centers (PACs) in the monument.

- Locate staging areas and other fire "activity centers" outside the park or at the park entrance more than a mile from designated Mexican spotted owl PACs.
- Carry out thorough rehabilitation of areas within and immediately adjacent to the Mexican spotted owl PACs affected by suppression actions.
- Avoid aircraft flight closer than 1,000 feet from any designated Mexican spotted owl PAC boundaries.
- Whenever possible, use natural barriers to avoid unnecessary fire line construction.
- If adequate water and pumps are available, use wet lines instead of hand line construction.
- Restrict prescribed fire and wildland fire use to low and moderate- intensity burns.
- Keep fire lines to a minimum width necessary to allow backfiring or creation of a safe blackline.
- For protection of rock pinnacles, do not use retardant and low- level aircraft, unless approved by the monument Superintendent.
- Monitor fire behavior and long- term effects on vegetative/habitat characteristics for adaptive management.
- Delineate maximum manageable areas to avoid impacts to sensitive areas.
- Do not allow use of heavy equipment or pumps, unless approved by the monument Superintendent.
- Use refueling stations with ground protection for refueling chainsaws to minimize chances of gasoline spills, and do not conduct equipment maintenance or fueling in wetlands.
- Do not move slash from upland sites into a wetland or place slash in open water.
- Ensure that fire crews access the monument on foot or by helicopter to avoid resource damage.
- Adhere to Arizona Department of Environmental Quality air quality standards to minimize impacts of smoke. This requires integrating weather data into burn plans, proper timing of burns, and correct permitting procedure.
- Plan for burning mosaics.
- Prevent erosion with water bars and replanting along erosion- sensitive slopes.
- "Rezone" high risk areas temporarily.
- Employ "Minimum Impact Suppression Tactics" when possible.
- Rehabilitate all fire lines, camps, and other disturbances.

Wilderness

- Manage wildnerness in accordance with the Wilderness Act
- Use minimum tool requirement for all fire activities and planning
- Do not allow aircraft, mechanized equipment (saws, vehicles, pumps) in wilderness without superintendent approval, and only when life and property are at stake.
- Do not allow wilderness camps, spike camps, or overnight use by fire crews/overhead/park staff
- Use only biodegradable retardant in wilderness areas
  Avoid use of foam that might persist in water sources in wilderness areas

Cultural Resources

- Locate and identify sites vulnerable to fire effects prior to prescribed burns or mechanical thinning. Use an archeologist who meets the Secretary of the Interior's standards.
- Follow protection and mitigation measures for known cultural resource sites, especially those vulnerable to fire and situated in or near the project area, before a prescribed fire project is initiated.
- Reduce fuels with thinning, buffers, and fuel breaks.
- Use suppression and line construction where appropriate but do not construct fire control lines through cultural sites. Employ "Minimum Impact Suppression Tactics" when possible.
- Cut heavy fuels (stumps) that could not be removed from cultural sites flush with the ground.
- Reduce fuels mechanically around cave entrances where cultural resources may be located.
- Monitor fire management activities, and halt work if previously unknown resources are located.
- Protect and record newly discovered resources during fire operations and post- fire surveys.
- Identify suitable slash disposal areas lacking cultural resources.
- Ensure presence of resource advisors during fire operations.
- Restrict ground disturbance activities in areas containing cultural sites.
- Do not use retardant and low- level aircraft, unless approved by the monument Superintendent.
- Use non- sensitive routes for vehicular access.
- Work with tribes and work crews to protect ethnographic resources.

Reasonable Alternatives

In the current fire planning effort, the differences among the three alternatives retained as reasonable are in the definition of Fire Management Units (FMUs). FMUs are areas of the park governed by distinct fire management strategies. Boundaries are clear and procedures are laid out in detail for each FMU. The schedule of future prescribed burns (Table II- 3; related map Figure II- 1) applies to all three alternatives except that under No Action and Alternative A, the burn units on the north, east, and south sides of the park do not extend onto the Coronado National Forest as shown on Figure II- 1 for Alternative B.

No Action Alternative

Existing (1992) Plan

Figure II- 2 defines the two fire management units of the existing FMP, the No Action Alternative. FMU #1 is a small area in the center of the park defined by natural and man- made features. FMU #2 completely surrounds FMU #1 to prevent the spread of fire across monument boundaries and protect life and property. These units allow wildland fire use (FMU #1), and suppression, prescribed fire, and non- fire treatments

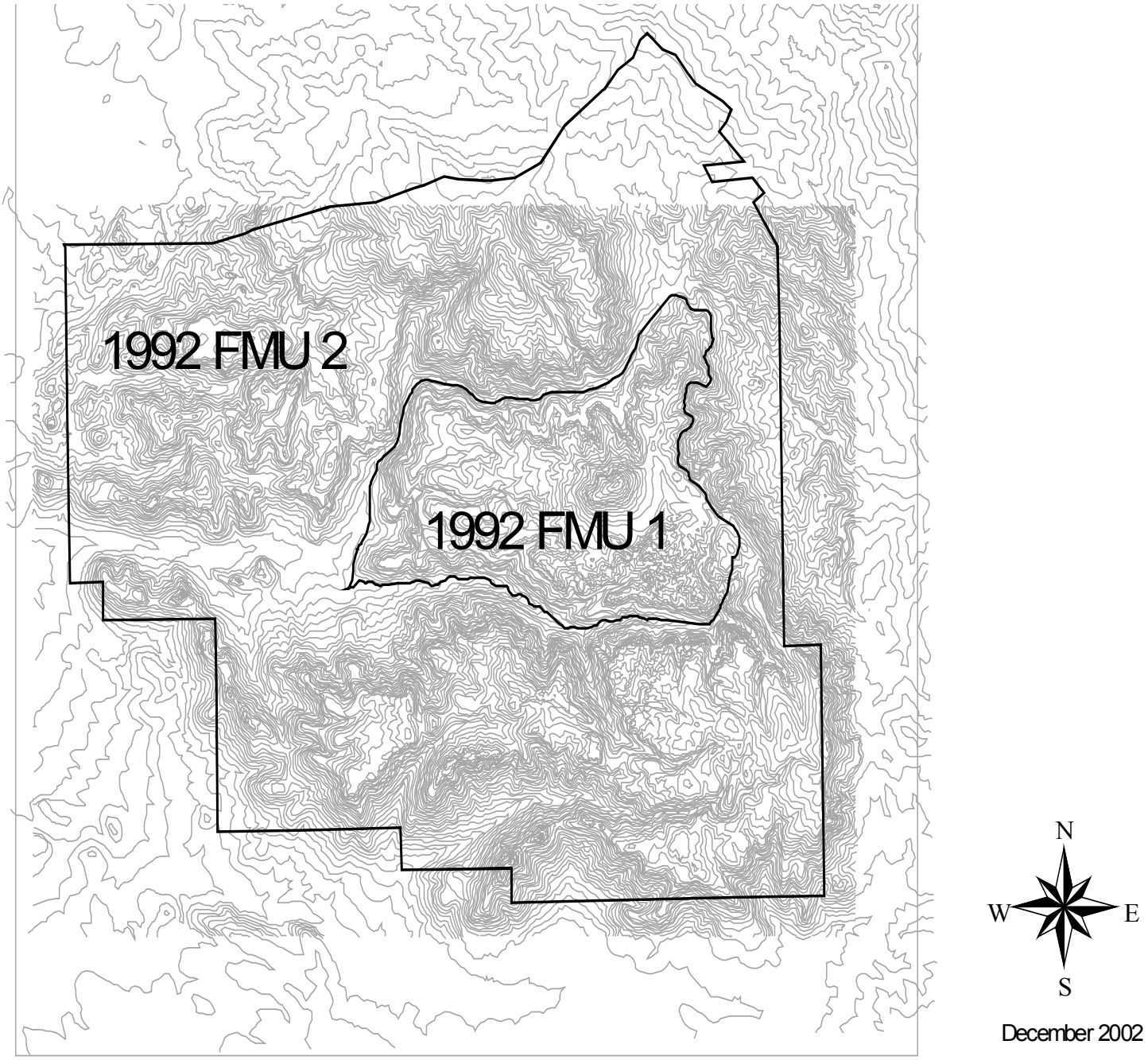

Figure II- 2. Arrangement of FMUs under the 1992 FMP (No Action Alternative).

(FMU #1 and #2). Wildland fire use allows natural ignitions to burn when they satisfy prescription parameters and are predicted to meet management objectives. Prescribed burns are carried out according to the program description above and is the same for all reasonable alternatives.

In FMU #1, the natural ecological process of fire is allowed to the maximum extent possible. The unit encompasses Sugarloaf Mountain, Massai Point, Rhyolite Canyon and its side canyons, and the south side of Bonita Canyon. All the park's vegetation communities are represented in FMU #1—mixed grasses with minor shrub- tree component, manzanita shrub community, mixed oaks, and pine with mixed conifers and hardwoods. The 1992 plan uses a different classification system for vegetation; classes listed here correspond to fire effects monitoring types currently in use at the monument. These types are discussed fully in Chapter III.

In FMU #1, fires must satisfy the decision criteria described in the wildland fire operations chapter of the 1992 fire plan. Lightning- caused fires, except those likely to escape from the unit or those that threaten human life and property, facilities, cultural resources, threatened and endangered species, or other important resources, are permitted to burn. Other conditions include:

- No more than two other fires burning within the monument
- Ignition date after July 5
- Energy release component and burning index no higher than 75th percentile values, with 90th percentile indicating "very high" fire danger
- No red flag watch or warning associated with current or forecasted weather
- No air quality restrictions resulting from ventilation conditions or state DEQ smoke curtailment requests
- Proper preparedness level, staffing, and resources in place

The 1992 FMP states that FMU #1 may be allowed to expand in the future as hazardous fuels are reduced and cooperative agreements are refined with adjacent land agencies.

FMU #2 is shown on Figure II- 2 as the area between FMU #1 and the monument boundary. In this unit the park suppresses all wildland fires. FMU #2 exists to keep fires within the monument and to protect human life and property within and beyond the boundaries. All the park's vegetation communities are represented in FMU #2, as listed above for FMU #1. In FMU #2, all unplanned fires would be suppressed regardless of cause or location of ignition (inside or outside the FMU). Suppression actions follow the 1992 FMP. Some of the FMU boundaries follow natural or human- made barriers, such as ridges or roads. However, most are along the monument's artificial boundary where strong initial attack and follow- up response are needed to keep fires small and confined.

Alternative A:
Corridor Plan
This alternative allows wildland fire use as well as prescribed burning in all park areas, with the exception of FMU #1, a narrow corridor containing developed areas (Figure II-3). FMU #1 contains cultural and natural resources as well as structures and other developments that are intrinsic to the existence and functioning of the park, including the Faraway Ranch Historic District (eligible for listing on the National Register of Historic Places), Visitor Center area (Visitor Center, housing, and maintenance yard), and Headquarters (formerly the superintendent's house). Also included within FMU #1 are Silver Spur meadow, the CCC camp area, and the campground. FMU #1 encompasses the monument's four major vegetation types: mixed grasses with minor shrub- tree component, manzanita shrub community, mixed oaks, and pine with mixed conifers and hardwoods.

In FMU #1, the park suppresses all wildland fires, whether the fire is human- or lightning- caused. This FMU exists to protect those natural and cultural resources described above, as well as park visitors and staff concentrated within the unit. To meet this objective, the park may use mechanical manipulation and/or prescribed fire to reduce fuel loading around structures and cultural resources within the unit.

Prescribed burns would have burn plans with specific objectives, as summarized in Tables II- 2 and II- 3. NPS would suppress all unplanned human- caused fires in a manner that causes the least damage to resources, people, and property under Alternative A. Non- fire treatments are the same as No Action—approximately 3 acres over the tenure of the plan.

Under Alternative A, FMU #2 consists of all areas of the park not included in the FMU #1 canyon- bottom corridor, plus about 6 miles of non- wilderness road right- of- way (Figure II- 3). The monument boundary with the USFS and private lands serves as the outer limit to FMU #2. This unit contains the bulk of the pinnacles that led to the creation of the park, as well as other notable cultural and natural resources requiring protection. Fewer developments are present than in FMU #1. These include the Massai Point exhibit, Sugarloaf Mountain lookout, and a mining cabin below King of Lead Mine. In addition, there are archeological sites including an Apache pictograph work shelter as well as other numerous Apache and pre- Apache work sites. FMU #2 contains all vegetation communities present in the park.

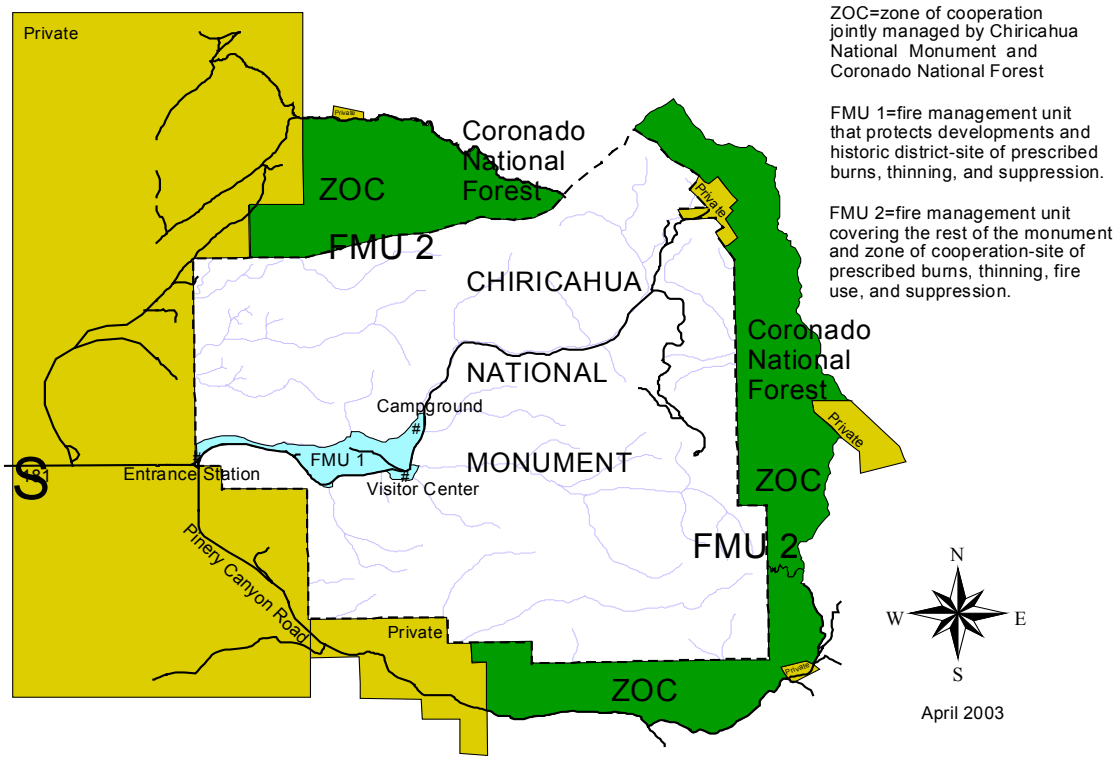

Figure II- 3. Arrangement of FMUs under the Watershed Plan (Alternative B). For Alternative B, FMU # 2 includes the ZOC on this map. For the Corridor Plan (Alternative A), FMU #1 is identical to that shown above, and FMU #2 stops at the monument boundary.

The white area is the monument, light shading denotes private land, and darker shading is the Zone of Cooperation or "ZOC"—Generally, USFS lands continue to the north, east, and south beyond the ZOC, and private lands stretch to the west. Private lands are not included within Fire Management Units and are shown for reference only.

FMU #2 allows appropriate management response (suppression/ containment), prescribed fire, non- fire treatments, and wildland fire use throughout the unit, up to the park's boundaries (11,685 acres). Fires would not be allowed to cross monument boundaries. With effective fire management and strong working relationships with both the USFS and private landowners surrounding the park, however, Chiricahua can apply wildland fire use up to the monument perimeter. In this unit, fires must satisfy the decision criteria proposed for the new (2004) fire plan. The causes of all fires would be determined in order to make proper management decisions, and all human- caused fire would require aggressive, but safe, appropriate suppression responses. Lightning-ignited fire is permitted to burn unless (1) prescriptions are not met or (2) the fire poses a threat to human life, property, facilities, cultural resources, threatened and endangered species, or any other important identified resource.

In addition, wildland fire use would be designated only:

- if there are no more than two other wildland fires of any type currently burning within the monument, or if any other fire activity does not preclude effective management of this fire
- if relative risk indicators or risk assessment results are acceptable to agency administrators for ignitions in FMU #2, or for ignitions on the edge of FMU #1 that have potential to move into FMU #2
- if the current and forecasted weather conditions do not indicate that a red flag watch or warning will be issued for southeast Arizona or that other fire weather factors are likely to cause the risk indicators to become unacceptable within the next three days (see Appendix I for seasonal prescriptions)
- if there are no requests from the Arizona Department of Environmental Quality for the curtailment of smoke production
- if fire activity in the region is such that resources are available to manage wildland fire use at Chiricahua National Monument

All wildland fire use would be monitored daily or more frequently in accordance with the National Park Service Fire Monitoring Handbook (2003) and the NPS Fire Situation Analysis. The park would continuously update information on fire size, location, behavior, smoke dispersal, safety conditions, and effects.

The monument would undertake reasonable efforts to minimize and mitigate the negative effects of the fire program under Alternative A. In general, public education and notification efforts will continue as in the No Action Alternative. Impacts on cultural and natural resources are mitigated through surveys, reduction of fuels around sensitive sites, avoiding harmful suppression tactics, and the presence of resource advisors during fire activities.

Alternative B:
Watershed Plan (NPS and Environmentally- Preferred)

The watershed plan modifies Alternative A's FMUs by extending the boundary of FMU #2 outside of the monument to the north, east, and south where the USFS (Coronado National Forest, Douglas Ranger District) is the neighbor. Figure II- 3 shows the arrangement. This alternative responds to the need for cooperative, interagency planning that would use natural, fire- relevant landscape features or roads to dictate the extent of fire management units rather than straight- line political boundaries. The watershed plan was developed in direct response to comments received during the FMP public scoping period, January 31 through March 15, 2002. As with the other alternatives, suppression remains the rule for all human- caused fires.

Roughly 5,300 additional acres (a little under half the size of the monument proper) lie in the new Zone of Cooperation (ZOC). Under this alternative NPS would continue managing fire within Chiricahua's boundaries according to the procedures outlined for Alternative A. However, wildland fire use and prescribed fire would only be permitted in the ZOC under one of the following two conditions:

- the current and forecasted (next 24 hours) fire behavior will not cause fire to leave the ZOC, or,
- if ZOC boundaries are threatened, the USFS is consulted and agrees to manage fire outside of the ZOC.

Practices within the ZOC would need to adhere to USFS policies. The decision- making would be divided up as follows:

- NPS will take the lead on planning prescribed burning within the ZOC.
- The two agencies will jointly decide whether wildland fire use is appropriate.
- When suppression is necessary, Coronado NF will decide how to suppress the fire within the ZOC.
- The USFS will take the lead on wildland fire use in the ZOC.

Case- by- case evaluations of fuel conditions and possible threats to public safety and health will determine whether natural fires are suppressed or allowed to burn. Grazing, mining, hunting, and backcountry camping occur on USFS lands included in the watershed alternative.

Figure II- 1 shows the prescribed burn complexes (larger subdivisions) and units proposed under Alternative B (for Alternative A, units would stop at the boundary). Tables II- 2 and II- 3 list objectives of future burns through the duration of the new FMP. The burn schedule is in Table II- 3.

The monument would undertake reasonable efforts to minimize and mitigate the negative effects of the fire program under Alternative B. In general, public education and notification efforts will continue as in the No Action Alternative and Alternative A. More wildland fire under this alternative will result in a reduction of hazardous fuels. Mitigating impacts on cultural and natural resources is accomplished through surveys, reduction of fuels around sensitive sites, avoiding harmful suppression tactics, and the

presence of resource advisors during fire activities. For the ZOC, public education and notification, as well as reduction of hazardous fuels, will reduce impacts of fire program activities.

Alternatives Eliminated from Detailed Consideration
The IDT identified five fire management alternatives at its internal scoping meeting on October 17–18, 2001. Input from the public led to the development of a sixth scenario identified as the "watershed" alternative. Described below are the three alternatives eliminated from detailed consideration and the reasons for their dismissal. The remaining three alternatives are described above in the "Reasonable Alternatives" section.

- Total Suppression Alternative

In the Total Suppression Alternative, all fires, regardless of origin, would be suppressed everywhere in the park.

Reason for dismissal: Fire is clearly needed to restore some park plant communities to health, and the park staff has the experience needed to allow fires to burn safely. The total suppression alternative prevents the monument from meeting FMP goal #2 (Reintroduce fire as a natural process in park ecosystems by allowing selected wildland fires to burn).

- Bubble Alternative

In the "Bubble" Alternative, individual features and structures would be protected with a small buffer zone. Otherwise, fires would be permitted to burn unless conditions were unsafe.

Reason for dismissal: Decision- making considerations led to the rejection of this alternative. Deciding whether and when to fight fires burning very close to places that require protection would be difficult. In inhabited areas there would be little safety margin for sudden changes in conditions. Under the Bubble Alternative it would be difficult to achieve FMP goal # 1 (Protect life, property, and resources from the unacceptable effects of unwanted wildfires and from fire management activities by providing for safe, aggressive suppression of wildfires).

- Landscape Alternative

Ideally, the NPS, USFS, and private landowners would together formulate an FMP that covered the entire landscape of the Chiricahua Mountains. Fires are not known for their respect for political boundaries, and with the recent history of high- intensity, widespread wildfires in the west, the public and policy makers are demanding more inter- agency coordination.

Reason for dismissal: A mountain- wide, completely integrated plan is a viable alternative for the long- term. However, Chiricahua National Monument needs an updated FMP as

soon as possible to guide its fire program. The staffing, resources, and outside facilitation needed to implement the Landscape Alternative are not currently available to the entities potentially involved. The Watershed Alternative (Alternative B) described above could be an intermediate step that would give parties experience working together under diverse missions and planning processes. Progress toward the landscape plan can occur while the monument continues its fire program guided by the FMP developed in conjunction with this DEIS.

Environmentally Preferred Alternative

The environmentally preferred alternative is defined as "the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (Council on Environmental Quality 1981).

NEPA Sections 101 and 102

The goals characterizing the environmentally preferred condition are described in Section 101 of the National Environmental Policy Act (NEPA). NEPA Section 101 states that "….it is the continuing responsibility of the Federal Government to …(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice; (5) achieve a balance between population and resource use which would permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

The environmentally preferred alternative is Alternative B, the Watershed Plan. Alternative B does the best job of meeting all six of the above criteria by balancing natural and cultural resource management needs with safety concerns. Under this alternative, interagency cooperation allows for fires to cross the border between NPS and USFS lands. This reduces hazard fuels over larger areas, thereby protecting park resources and visitors from the effects of widespread high- intensity fires which can negatively impact natural resources over the long- term and permanently affect cultural resources (criteria 1, 2). Interagency agreements and shared resources make for more efficient fire management and increase the likelihood that fire can be managed for intended outcomes (criteria 3, 4). Low- and moderate- intensity fires will result in mosaics of burned and unburned vegetation, improving wildlife habitat as well as recreational opportunities for the public and aesthetics (criteria 5). Recycling of

depletable resources is expected to be greatest under this alternative because there will be more fire over a larger area (criteria 6).

The No Action Alternative is likely to allow the least amount of fire on the landscape, with suppression and prescribed burning over much of the park and only a small backcountry FMU where wildland fire is allowed. It moderately fulfills criteria 2 but results in the greatest build up of fuels and the greatest likelihood of widespread, high-intensity fire. Ensuring the safety of park visitors, staff, and firefighters under extreme fire conditions is difficult and high intensity fire can impair natural, recreational, and visual amenities over the long- term, as well as permanently destroy historical resources.

Alternative A fulfills the six requirements of NEPA Section 101, but to a lesser degree than Alternative B. More wildland fires are allowed than under the No Action Alternative, but fires must stop at the monument's borders. Consequently, there will be less fuel reduction, with fewer benefits for natural resources, wildlife, and visitor experience than Alternative B (criteria 1, 2, 3, 6). Continuing fuel buildup could lead to widespread fire, placing cultural resources at greater risk (criteria 4). A widespread fire limits the areas available to people and wildlife, potentially increasing stress on unburned areas (criteria 5).

Summary of Reasonable Alternatives

Table II- 4 provides a comparative summary of the important features of the alternatives. Table II- 5 summarizes the degree to which the alternatives meet FMP purpose, need, goals, and objectives. Table II- 6 reviews impacts of alternatives on each of the ten impact topics. Each of the retained alternatives contains a different mixture of the same elements: suppression, prescribed fire, and wildland fire use for resource benefit. There is no way to specify exactly how much of each strategy would apply if any one of the alternatives were selected, because the applicability of each strategy depends on weather and chance ignitions. However, the IDT speculated that the No Action Alternative would cause the fewest short- term, direct adverse effects and result in the fewest long- term, direct and indirect benefits. Alternative B (Watershed) would cause the most short- term, direct adverse effects and result in the most long- term benefits. Alternative A (Corridor) would have intermediate effects and benefits. Impact topics are analyzed in detail in Chapter IV.

Several prescribed burns are scheduled to take place over the next few years regardless of which alternative is selected. Table II- 7 examines how each alternative is likely to affect the chances that each burn will meet its particular objectives.

All alternatives provide for regular mechanical thinning around historic structures and developments to avoid the former, and Alternative B is predicted to best avoid adverse impacts of high- intensity, widespread wildfires, followed by Alternative A, and finally the No Action Alternative.

Table II- 4. Major Features of Fire Management Alternatives

Component	**No Action Alternative Existing 1992 plan**	**Alternative A Corridor plan**	**Alternative B Watershed plan**
Wildland fire use *Natural ignitions (lightning)*	Suppression of all wildland fires except in small area in center of park. Restricted to 2,000 acres. Expect no wildland fire use over the tenure of the new plan due to strict go/no- go criteria.	Suppression of all wildland fires in canyon bottom corridor containing developments. Wildland fire allowed elsewhere up to monument boundary (total of 11,685 acres). Expect 1 wildland fire use ignition over next 10 years.	Similar to Alternative A except wildland fire allowed to cross out of monument up to natural watershed boundaries on USFS land (total of 16,985 acres). Expect 1 wildland fire use ignition over next 10 years.
Prescribed fire *Ignited by staff for management purposes*	Yes, in both FMUs (over 4,250 acres through 2012).	Same as No Action Alternative.	Same as No Action Alternative.
Non- fire treatments *Thinning by chainsaw plus slash disposal or pile burning*	Approximately 3 acres in both FMUs.	Same as No Action Alternative.	Same as No Action Alternative.
Interagency cooperation	As needed.	As needed.	Includes USFS in the ZOC.
Wildland fire accepted on Forest Service side of the boundary	Not without Forest Plan amendment.	Not without Forest Plan amendment.	Yes, with interagency coordination and approval of this NEPA document.

Table II- 5. Effectiveness of Alternatives in Meeting Goals and Objectives

	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
1. Protect life, property, and resources	Safety is first priority for fire management activities. Most effective in providing safety to the public, staff, and property in the short- term with high level of suppression.	Effective in light of required actions that mitigate threats to life and property.	Most effective in the long- term as hazardous fuel loads are reduced.
2. Reintroduce fire as a natural process.	Least effective. Suppression dictated for most of the park.	Effective due to widespread wildland fire use.	Most effective due to wildland fire use out to watershed boundaries outside the monument.
3. Apply fire to accomplish desired resource management objectives.	Least effective in applying fire for maintaining fire-influenced historic scenes and patterns of succession.	Effective. Allows fire over most of the area up to park boundaries for management purposes.	Most effective at duplicating fire's landscape effects, reinforcing historic scene, and reestablishing natural patterns of succession.
4. Base the fire program on sound data.	Least effective at integrating the latest data supporting fire as an ecological component. Post- fire monitoring and research activities similar for all alternatives. FMP to be revised in light of monitoring information.	Effective due to liberal use of wildland fire, moving vegetation types toward desired structural conditions.	Most effective, given watershed-based program.
5. Integrate fire program concerns into activities of all park divisions.	Effective.	Effective.	Effective.
6. Manage fire cooperatively with adjacent land	Least effective. Insulates surrounding lands with suppression	Effective, as it requires heightened	Most effective at establishing cooperative fire

	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
management agencies and private landowners.	zone.	collaboration with USFS and neighbors.	management with USFS.

Table II- 6. Impact Summary

Impact Topic	Overview	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
1. Life and Property Fire is an effective tool for reducing hazard fuels, but it can also be a threat to the public, firefighters, monument staff, and developed areas.	Safety is the highest-level consideration. The FMP dictates actions for contingencies when life and property are threatened. Manual treatment reduces fuels around developed areas.	Short- term, minor to moderate, adverse impacts; long- term potential for minor to possibly major impacts. This alternative applies the most suppression, resulting in more risk to firefighters and less to staff, public, and property in the short-term. Higher risk in the long- term from built- up fuels is partially moderated with prescribed burning.	Short- term, negligible to moderate, risks to firefighters are reduced with more wildland fire use. Long- term threats to life and property are moderated as prescribed burning and wildland fire use objectives are met. Long- term benefits would accrue as management objectives are met.	Similar to Alternative A, with the greatest potential for beneficial long- term risk reduction as fuels in the ZOC adjacent to the park on USFS land are reduced by burns.
2. Visitor Experience and Tourism Potential restrictions on access to burning areas, road closures, traffic, and smoke can alter visitor experience; but the fire program also provides interpretive opportunities. Local businesses may temporarily suffer if park visitation declines due to fire.	Prescribed burning and wildland fire use limit high- intensity, widespread fires that can negatively impact visitor experience. The park can interpret fire and fire effects to educate visitors. The park is diligent about informing the local community about fire. Crews brought in to manage or fight fires buy food and lodging locally.	Short- term, minor, adverse impacts with the potential for moderate to major impacts in the event of large fires. Suppression should minimize short-term effects. Keeping the public well informed helps reduce negative effects. Possible temporary effects to local businesses from visitor use restrictions, but effects should be offset by availability of other destinations in the region. Intensity of impact directly	Short- term, minor to moderate, adverse impacts. Moderate, long-term, beneficial impacts. More fires increase impacts to visitor experience and tourism in the short- term but reduce likelihood of large catastrophic fires.	Short- term, minor to moderate, adverse impacts. Long- term, major beneficial impacts. Similar to Alternative A, with lower fire risks over time with fuel reduction inside and outside the park in the ZOC.

Impact Topic	Overview	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
		related to size, severity, and location of fire.		
3. Cultural Resources Historic structures, landscapes, and artifacts may incur fire damage, although fire may help reduce surrounding hazard fuels and maintain the historic scene.	Prescribed burning would reduce fuel buildup near structures. In the fire plan, suppression is dictated for highly sensitive areas.	Potential for moderate, adverse impacts. Possible greater effects of ground-disturbing suppression activities under this alternative.	Potential for minor to moderate, adverse impact. Minor to moderate benefits to cultural resources from reduction in fuel loads in and around sites.	Minor to moderate, direct and indirect, impacts. Greatest potential for benefits. Similar to Alternative A, with the smallest potential for disturbance as a result of suppression actions.
4. *Vegetation* Fire would benefit many species in the long- term but would kill and injure some plants in the short- term.	Some death and injury cannot be avoided, but fire thins crowded stands and promotes sprouting and germination of many plant species.	Short- term, moderate, direct, adverse impacts. Long- term, moderate, adverse impacts. Maximum suppression would minimize death and injury to plants in the short- term and favor late seral species. Risk is highest for high- severity fire following buildup of fuels that would lead to lower overall diversity.	Short- term, minor to moderate, adverse impacts. Long- term, moderate, beneficial impacts. Increased wildland fire use for resource benefit would affect plants intolerant of fire but would benefit many species and likely increase diversity in the long- term.	Similar to Alternative A, except potential for high-severity fires subsides over time with more burning within the monument and in the ZOC. This would result in moderate to major, beneficial effects.
5.Wildlife Fire would benefit many species in the long- term but would kill and injure some wildlife in the short- term.	Some death and injury cannot be avoided, but wildlife benefits from fire- renewed habitat.	Short- term, minor to moderate, direct adverse impacts. Long- term, minor to moderate, adverse impacts. Maximum suppression would minimize death and	Short- term, minor, adverse impacts. Long-term, beneficial impacts. Increased wildland fire use for resource benefit would affect animals intolerant of fire but	Similar to Alternative A, except potential for high-severity fires subsides over time with more burning within the monument and in the ZOC.

Impact Topic	Overview	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
		injury to animals in the short- term. Risk is highest for high- severity fire following buildup of fuels leading to lower overall diversity. Prescribed fire mosaics preserve unburned areas as refuges for animals and reduce risk of conflagration.	would benefit many species and likely increase diversity in the long-term.	
6. Unique Sites and Wilderness Fire may change the character of unique natural sites and wilderness in the park	Prescribed burning to reduce fuels facilitates protection of sites. Unique, fire- adapted ecological sites in the park benefit from burning.	Short- term, minor to moderate, adverse impacts. Fire suppression and fuel reduction minimize short-term damage. Potential for surface and subsurface disturbance during fire suppression activities. Some unique sites would suffer from lack of fire.	Similar to the No Action Alternative, except likelihood of harmful fires decreases with increased prescribed burning and wildland fire use. Opportunities for positive impacts with greater wildland fire use.	Similar to Alternative A, but with long- term, moderate to major, beneficial effects with greatest amount of wildland fire use. Likelihood of fires entering monument along the USFS boundary would lessen as more burning takes place in the ZOC.
7. Erosion and Debris Flow Fire can remove vegetation from slopes and cause increased erosion until plants regrow.	Prescribed burning limits high- intensity, widespread fire and creates vegetation mosaics that reduce soil exposure and erosion potential.	Short- term, moderate, adverse impacts. Potential for long- term, major, adverse impacts as suppression continues. Rocky slopes moderate potential of erosion. Potential for significant effects from high-intensity, widespread wildfire following	Short- term, minor to moderate, adverse impacts. Similar to the No Action Alternative, except potential for high-intensity, widespread wildfire reduced with wildland fire use.	Similar to Alternative A, except potential for high-intensity, widespread wildland fire reduced with wildland fire use and burning in ZOC.

Impact Topic	Overview	No Action Alternative	Alternative A Corridor	Alternative B Watershed (Preferred)
		widespread suppression and little prescribed burning.		
8. Air Quality Smoke from fires can be unhealthy, a regulatory problem, and view- obscuring.	Prescribed burns that reduce fuels are conducted only under strictly defined conditions that minimize potential for poor air quality.	Short- term, minor to moderate, adverse impacts with suppression of most fires. Future wildland fires fed by non- thinned fuels would potentially degrade air quality, with potential for moderate to major impacts.	Short- term, minor to moderate, adverse impacts. Long- term beneficial impacts. More burning would generate more smoke, but air quality benefits in the long- term with reductions in fuels and prevention of extensive fires.	Similar to Alternative A, except burning in the ZOC reduces the likelihood of fires escaping the monument and growing into bigger smoke-generating events.

Table II- 7. Alternatives Best Accomplishing Burn Unit Objectives
Complexes and burn units are shown on Figure II- 3. Projects are listed in chronological order as proposed in Table II- 3.
MSO PAC = Mexican spotted owl protected activity center.
Vegetation Types: G=Mixed grassland, M=Manzanita shrub, O=Oak woodland, P=Mixed conifers and hardwoods

Complex	Burn Unit	Veg Types	Purpose of Project	Alternative Best Accomplishing Objectives
Whitetail	Massai Saddle	P, O, M	Conduct first burn in area with long (unknown) interval since last fire	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
South	Hand's Pass	M, P	Restore historical frequent fire interval to pines in drainage	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
HQ	Lower Rhyolite	O, P	Reduce fuels to protect canyon- bottom developments; thin overstocked oak stands	Alternatives are equal—burn unit lies within suppression FMU under all three
Whitetail	East Whitetail	M, O	Cooperative project with USFS for restoring historical frequent fire interval to pines in drainage	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
Highlands	Echo Park	P	Conduct low- intensity burn for MSO PAC maintenance	Alternatives are equal—unit lies within wildland fire use FMU under all three

Whitetail	Shake Spring	M, P, O	Conduct low- intensity burn for MSO PAC maintenance	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
Faraway	South Slope	G, M	Reduce fuels to protect canyon- bottom developments and historic structures	Alternatives A and B—under these two alternatives wildland fire use is possible in this unit, but fires would need to be stopped at the west and south boundaries
Highlands	Upper Rhyolite	P, O	Restore historical frequent fire interval; thin overstocked oaks	Alternatives A and B—under these two alternatives wildland fire use is possible in this unit to help accomplish objectives
South	Jesse James	P, O, M	Open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
HQ	Rhyolite # 5	O, P	Reduce fuels to protect canyon- bottom developments; thin overstocked oak stands	Alternatives A and B—under these two alternatives wildland fire use is possible in this unit to help accomplish objectives
Highlands	Inspiration Point	P, O	Reburn for restoring historical frequent fire regime	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
Highlands	Echo Park	P	Conduct low- intensity burn for MSO PAC maintenance	Alternatives are equal—unit lies within wildland fire use FMU under all three

South	Little Jesse James	P, O, M	Open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands	Watershed alternative (B)—allows wildland fire use to help accomplish objectives without having to suppress at the boundary
Faraway	North Slope	G, M	Research burn to look at Lehmann lovegrass response	Alternatives are equal—research burn would be carried out under all three

Chapter III: Affected Environment

Chiricahua National Monument, while characterized by its striking geology, is also rich in ecological and cultural resources. Fire is one of the processes that has shaped the character of the park, and it is an important consideration with regard to protecting park resources. This chapter describes key aspects of the monument that pertain to potential impacts of the fire program. It also describes relevant feature of Alternative B's ZOC where Chiricahua National Monument would co- manage fire on about 5,300 acres of Coronado National Forest (see Figure II- 2). These lands to the north, east, and south of the boundary are extensions of monument watersheds. Their inclusion makes the management of fire safer, cheaper, and more likely to mimic natural patterns. Selection of Alternative B would permit the Coronado National Forest to allow wildland fire use in the ZOC area prior to adoption of a Forest Plan amendment to expand wildland fire use beyond wilderness areas. At present little prescribed burning and thinning are planned for the northern Chiricahuas.

ZOC elevations are within the range found on the monument. The pinnacles that spurred designation of the monument are absent from the ZOC, but otherwise the landscape is a continuation of what is found inside park boundaries. Vegetation types continue seamlessly onto the forest, faunas are the same, sensitive species are shared, rocky terrain reduces erosion concerns in both places, and the airshed is continuous. Visitors to both places have ample alternate destinations in the event of disruption of plans by fire operations.

Impact Topic 1 (Life and Property)
The lack of roads, rugged terrain, and wilderness designation for most of the park make firefighting a challenge at Chiricahua. Developments, except for the geology building at Massai Point and the Sugarloaf lookout, are restricted to a 2.5- mile long corridor stretching east from the entrance. Historic and modern structures house monument operations and require protection from fire. For a burning/thinning program carried out during 2000- 2002, the monument drafted a Wildland/Urban Interface Prescribed Burn Plan to address hazardous fuels around the primary structures of the Headquarters, Bonita Campground, Faraway Ranch Historic District, and Visitor Center areas. The list below itemizes developments requiring protection from fire. This first group of developments is located in FMU #2 in the No Action Alternative (see Figure II- 1) and FMU #1 under Alternatives A and B (see Figure II- 2).

- entrance station building
- air quality station just north of the entrance station
- headquarters
- bird banding stations
- boneyard
- visitor center
- housing area

- maintenance yard
- campground

The following two developments are located in FMU #1 under the No Action Alternative (see Figure II- 1) and FMU #2 under Alternatives A and B (see Figure II- 2):

- geology exhibit building on Massai Point
- Sugarloaf lookout

Wilderness areas call for minimum impact management, including minimum tool analysis. In these areas, crews engaged in fire suppression will arrive on foot, use hand tools only, and expect no helicopter support. A superintendent can override these provisions under emergency conditions when threats to life and property supersede maintenance of wilderness values.

There are no developments requiring protection in the ZOC. Three forest inholdings abut the zone boundary (West Whitetail, Indian Creek, and North Fork). Five mining claims at the north end of the east monument boundary (T16S, R30E, section 18) are owned by monument neighbors Ralph and Mary Pursley; Amended New Haven, Queen of Sheba, Redhorse, Rex Plomo, and King of Lead Mines are all abandoned. The area is also the site of grazing (four permittees), hunting (during fall and winter), camping, and hiking, though it is not one of the heavily used parts of the Chiricahuas. Pinery Canyon Road, which forms a portion of the south boundary of the ZOC, is a trans- mountain route; however, more people use the road to get to the other side of the range than use the area for recreation.

Two areas just beyond the ZOC require consideration relative to fire activities. The Methodist Camp is located just over two miles south of the ZOC boundary on USFS land (T17S, R30E, section 19), operated under provisions of a special use permit issued by the USFS. It is in use year- round, with especially heavy use in the summer. Off-season, the camp hosts disabled groups. The East Whitetail residential development is located on private land about one mile east of the ZOC (T16S, R30E, sections 33, 34, 35). Access is from the east side of the Chiricahuas rather than through the monument on the west side.

Firefighting resources listed in Table III- 1 are available to the monument for managing fires. To protect life and property under extreme fire conditions, the incident commander would request additional resources from the region and/or national office.

Impact Topic 2 (Visitor Experience and Tourism)
The monument received 79,966 visitors in 2002. Visitors generally arrive by car and stay for part of a day. They often follow the eight- mile long road through Bonita Canyon to Massai Point, with stops at Faraway Ranch and the visitor center. Visitors follow the same road up and back; there is no loop. There are interpretive displays and a bookshop

in the visitor center. At Faraway Ranch, an interpretive tour gives visitors a glimpse of ranching life in the early 1900s. Massai Point and Sugarloaf Mountain offer commanding views of the park, desert valleys, and mountain peaks. A trail system connects Massai Point, Echo Park, the Heart of Rocks scenic area, Rhyolite Canyon, and the visitor center. Other trails allow visitors to climb Sugarloaf Mountain, the highest visitor access point in the park, and explore the Picket Canyon area and lower Bonita Creek. A campground is located 0.2 miles north of the visitor center. Many visitors come to enjoy the wildlife at Chiricahua. Chiricahua Mountains are widely regarded as one of the top birding spots in the U.S., and reptile and mammal species that are found in few places north of the Mexican border also draw visitors.

Most of the ZOC is served only by unimproved roads and rarely visited. Dispersed camping in the southern part of the ZOC occurs seasonally at low numbers. Hunters are the most likely users of the 5,300- acre area. The 2002- 2003 combined seasons allowed white- tailed and mule deer hunting over a total of 90 days (October 25- 28, November 1- 17, December 13- 31, January 1- 31) in game unit 29 (Arizona Game and Fish Department 2001). Unit 29 grants up to 1,500 permits and measures approximately 650,000 acres, including the northern three- fourths of the Chiricahua range. Javelina, bear, dove, quail, and cottontail hunting also take place in unit 29.

Chiricahua National Monument and neighboring Forest Service areas are among many natural attractions found in Cochise County, Arizona. Tourism is an important contributor to the local economy, and most tourists visit the area to enjoy several attractions, not just the monument. Local motels, restaurants, and other services cater to people traveling on Interstate- 10 or visiting the region, in addition to monument visitors. A single bed- and- breakfast is situated just south of the monument; otherwise, the nearest lodging is about 15 miles away in Turkey Creek, though most visitors to the area probably stay in Willcox, located 36 miles from the monument. The attractions listed in Table III- 2 are alternate destinations for visitors avoiding the monument in the event of fire- related closures or inconveniences. During fire management activities, the surrounding community can benefit in the short- term by supplying lodging, food, and other basic services to firefighters.

Table III- 1. Firefighting Resources Available to the Monument

Resource Type	Location	Response Time
Two Type 6 Engines	CHIR* Maintenance yard	15 minutes
Type 6 Engine	FOBO* Visitor Center	1 hour
Fire Fighter Type 2 squad (5 permanent staff) Seasonal fire crew	CHIR	20 minutes
Fire Fighter Type 2 squad (5 permanent staff) Off- season fire crew	CHIR	1 hour
Incident commander – fire season	CHIR	15 minutes
Incident commander – off- season	CHIR	30 minutes

*CHIR = Chiricahua National Monument
FOBO = Fort Bowie National Historic Site

Table III- 2. Cochise County Attractions Surrounding Chiricahua National Monument (CHIR)

Name	Description	Activities	Miles from CHIR	Closest town
Rex Allen Museum	Cowboy museum	Western movie & cowboy memorabilia	36	Willcox
Cochise Stronghold (USFS)	Box canyon in Dragoon Mountains	Hiking, rock climbing, petroglyphs, picnicking, camping, birding, wildlife viewing	40	Pearce, Sunsites
Cave Creek Canyon (USFS)	Intersection of four major biotic and geographic zones	Birding, cliffs, hiking, picnicking, camping, wildlife viewing	20	Portal
Fort Bowie (NPS)	National Historic Site	Hiking, birding, camping, fort ruins, wildlife viewing	15	Dos Cabezas
Rustler Park (USFS)	Recreation Area	Hiking, birding, camping	10	Portal
Willcox Playa Wilderness Area (BLM)	Dry lake bed	Birding	10	Willcox
Camp Rucker (USFS)	Recreation area	Camping, historic site	20	Elfrida
Chiricahua Wilderness Area (USFS)	Wilderness area	Hiking, backpacking, birding, striking geology, hunting	20	Portal
Dos Cabezas Mountains (BLM)	Wilderness area	Hiking, birding, camping, backpacking, rock climbing & scrambling, wildlife viewing	25	Bowie

Muleshoe Ranch Cooperative Management Area (TNC)	Riparian area	Camping, hiking, birding	30	Hookers Hot Springs
George Walker House	Guest house	Birding	15	Paradise
Turkey Creek (USFS)	Riparian canyon	Hiking, camping, picnicking	15	Pearce

Impact Topic 3 (Cultural Resources)
The earliest evidence of human habitation in the Chiricahua area dates from 8000 BC. By 1200 AD, agriculture became important and sustained local villages. By 1450, the occupants of these villages abandoned the area. Apache ancestors are believed to have arrived in the late 17th century. The Spanish were the first Europeans in the Southwest and the first to encounter the Apaches (Spicer 1962). The ebb and flow of European settlement in the southwest in the late 18th and early 19th centuries—first the Spanish, then the Mexicans, then the Americans—was influenced to a great extent by relations with the Apache. Remnants of villages, camps, worksites, and cultural landscapes from pre-Apache, Apache, and early Anglo times have become important cultural resources for the monument.

From 1790 to the early 1820s, numerous land grants were issued by the Spanish and Mexican governments for cattle ranches throughout what is now southern Arizona. Cattle numbers increased greatly, with herds running feral over much of the range (Wagoner 1975). Arizona became part of the United States after the Gadsden Purchase in 1853. After a period of decline due to Apache raids, cattle ranching again began in earnest, with overgrazing taking its toll on much of the range by 1890 (Haskett 1935).

At the site of the future monument, the Stafford homestead lasted from 1880 to 1918. The ranching era continued into the 20th century when, in 1917, the pioneering Erickson family began to operate a guest ranch—the Faraway Ranch that sits at the west end of Bonita Canyon in the monument today. The house at Faraway was built in 1887. Fences, windmills, dumps, and machinery are among the significant ranching- era relics. The Faraway Ranch and Stafford cabin are listed on the National Register of Historic Places as a historic district. The entire district includes eight ranch buildings and a cemetery.

A highlight of the "federal" era—the time since 1879 when the area came under the management of first the USFS, then the National Park Service—was the encampment of the Civilian Conservation Corps in Bonita Canyon between 1934 and 1940. Today in the monument there are more than twenty buildings, trails, and support system units listed on historic registers that are the "C's" legacy (Black and Neilsen 1999).

The best insight available for understanding the archeology of the monument comes from Baumler's (1984) work *The Archeology of Faraway Ranch, Arizona—Prehistoric, Historic, and 20th Century*, associated with the Historic Structures Report (Torres and Baumler 1984). Although concentrating on the Faraway Ranch area, Baumler found an abundance of localities representing activities from prehistoric through historic and 20th century times, right up to the acquisition of the ranch by the NPS in the 1970s. Other information comes from limited surveys conducted prior to clearing for building construction or prescribed burning.

There is no detailed, recorded use of fire as a tool in the monument. It is probable that prehistoric and historic native cultures of the Chiricahuas used it as noted elsewhere—

for improving game range, clearing forest and brush, clearing fields, opening vistas, and improving feed for horses (Pyne et al. 1996). However, Seklecki et al. (1996) found no conclusive evidence that periods of high fire frequency in Rustler Park, above the monument in the Chiricahua range, could be explained by Apache activities. There is some debate in the literature about how common Apache- set fires really were in southern Arizona. Hastings and Turner (1965) reviewed 19th- century U.S. military accounts that recorded little use of fire; Dobyns (1981) suggests the military diarists were exactly the sort of people Apaches wanted to avoid, thus they would not set fires when troops were nearby. Dobyns bases his view, that Apaches frequently set large fires in grasslands to drive game, on earlier Spanish and Mexican accounts and on early 20th- century ethnographers that interviewed Apaches about their former customs. The late 19th- century press in southern Arizona frequently attributed fires to Apaches but provided no documentation for such claims (Bahre 1991).

On modern ranches at the mouth of lower Bonita Canyon, fire is still routinely used to maintain pastures. Local ranchers commonly burn pastures on a rotation ranging from two to five years. Lower Bonita Canyon was homesteaded, farmed, and grazed from about 1879 to 1960. Fire could have been used periodically during this time to clear fields and orchards and improve pastures. Historical photographs show fields and an open grassland/woodland in lower Bonita Canyon, which are now encroached by trees and shrubs. There was also a military encampment in lower Bonita Canyon during the campaign to capture Geronimo in 1886.

Impact Topic 4 (Vegetation)
Chiricahua National Monument (and Alternative B's adjacent ZOC) is biotically and topographically diverse. The diversity reflects many factors, including latitude, elevation, topography, soil composition, precipitation, climate, and natural fires. Two biogeographical transition zones also affect species composition. The lowlands of Chiricahua National Monument are in the Chihuahuan- Sonoran desert interface; Lowe and Zweifel (1992) place the Chiricahuas just south of the line dividing Rocky Mountain from Madrean influences in the Madrean Archipelago. These transitions cause some overlap of generally east- west and north- south species distributions and also make the region the limit of many species' geographical ranges (Lowe 1992; Felger and Johnson 1995).

Vegetation Types
Fire planning at Chiricahua uses four structural types. The absence of fire has likely altered vegetation stand structure and succession in all vegetation types. Taylor's (2003) work has documented increases in woody canopy cover, woody species densities, and fire- intolerant species densities and decreases in open areas during the 20th century (Table III- 3). These types continue seamlessly onto the adjacent Coronado National Forest lands.
Table III- 3. Changes in Cover Types at Chiricahua National Monument from 1935 to 1993, from Taylor (2000)

Type	Coverage in 1935	Coverage in 1993	Change (% of total park acres)
grassland	4.8%	3.9%	−0.9%
savanna	4.9%	4.2%	−0.7%
savanna/rocky	0.2%	0.1%	−0.1%
open woodland	18.1%	10.7%	−7.4%
open woodland/rocky	2.3%	1.8%	−0.5%
closed woodland	43.2%	52.9%	+9.7%
open chaparral	14.6%	10.6%	−4.0%
closed chaparral	11.5%	15.6%	+4.1%
residential	< 0.1%	< 0.1%	- -
barren	0.4%	0.3%	−0.1%

Pine with Mixed Conifers and Hardwoods

Approximately 1,900 acres of this type are found in Rhyolite and Jesse James Canyons and their tributaries and at the highest elevations in the monument (Figure III- 1). The Arizona pine, Apache pine, and Chihuahua pine are important components of this structural type. They are thick- barked, fire- tolerant species that would dominate with increasing fire frequency. Ponderosa pine also needs the kind of exposed, mineral seedbed that fire helps create for successful germination. As overstory trees and understory shrubs thin out, grasses and forbs move in and recreate what is thought to be a more historically natural scene. The forbs and grasses become the fine fuels that help carry frequent low- intensity fires; longtongue muhly, bullgrass, and pinyon rice grass are characteristic of this type. A recent USFS review (Paysen et al. 2000) attributes this fire regime common to southwestern ponderosa pine "woodlands" to the early summer dry weather, the presence of grass and pine needles, and lots of lightning. Under this regime, effects on individual trees might vary, but the pine overstory generally survives fires. The monitoring plan (Dennett et al. 1998) includes a target burn interval of 9–21 years as the prescription for this type, based on fire history studies in the monument (Swetnam et al. 1989; Baisan and Morino 1999).

Other trees and shrubs associated with this structural vegetation type either resprout (oaks, Wright silk tassel) or are killed and reseed (pinyon pine, pointleaf manzanita). Barton (1999) suggests that oaks are favored by infrequent or high- intensity fires due to their rapid sprouting ability, whereas pines are favored by moderate- intensity or more frequent fires due to their fire tolerance. Chihuahua pine, unlike other pines, also has the ability to sprout after fire.

Table III- 4 describes the generally overstocked condition of pine with mixed conifers and hardwoods at the monument.

This structural vegetation type also has the following characteristics:

- Condition class 2—fire frequency outside historic range.
- Recent burns have decreased fuel loading and increased native grasses.
- Anderson (1982) fuel models for type:
    - Model 9: Forest with moderate litter and concentrations of dead-down woody materials. Little understory development in predominantly pine stands. Litter is the primary carrier of fire.
    - Model 10: Forest with heavy dead- down material loads; live understory. Litter and grass are the primary carriers of fire. Shrubs and sapling trees act as ladder fuels.

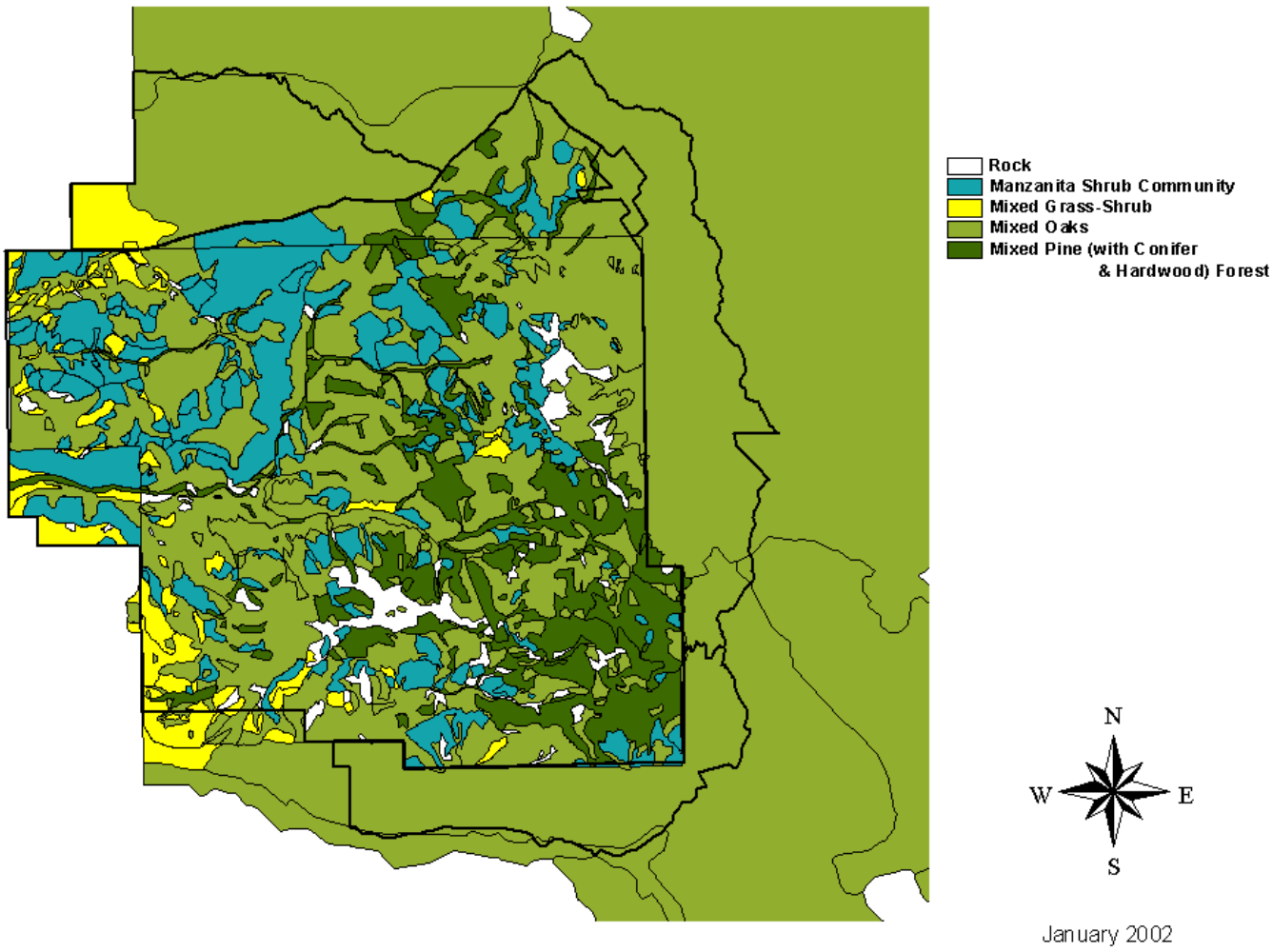

Figure III- 1. Distribution of Structural Vegetation Types

Table III- 4. Existing Conditions by Structural Vegetation Type

Pine with Mixed Conifer and Hardwoods	Mixed Oak Community	Manzanita Shrub Community	Mixed Grasses with Minor Shrub/Tree Component
Overabundance of pole- sized pine and oak trees Heavy dead and down fuel loadings Excess overstory pine tree density Excess manzanita cover High fuel loadings Deficient cover of native grasses and forbs	Overabundance of pole- sized oak trees; abundance of large, multi-stemmed oaks Excess overstory oak tree density Deficient cover of native grasses and forbs Excess manzanita and other shrub cover Heavy dead and down and litter fuel loadings Increasing abundance of non-native plants, especially weeping lovegrass and tansy mustard	Excess manzanita cover Increasing cover of acacia, mountain mahogany, and silktassel Deficient cover of native grasses and forbs Excess cover of Lehmann and weeping lovegrasses	Deficient cover of native grasses and forbs High density of woody invasive species Increasing abundance of non-native plants, particularly hare barley, camphorweed, Johnson grass, longspine sandbur, stinkgrass, and Lehmann and weeping lovegrasses

- Southern pine bark beetle in Chihuahua and Apache pines throughout the park at roughly 10% infestation rate.
- No exotic invasive species problems.

Mixed Oaks

Figure III- 1 shows that oak woodlands grow on more than half the monument (7,500 out of 12,000 acres). Emory oak, Arizona white oak, and silverleaf oak are the most dominant species of this structural vegetation type; all resprout following topkill by fire. Other species in this woodland mix include alligator juniper, Apache pine, netleaf oak, turbinella oak, Arizona cypress, Gambel oak, Toumey oak, and Chihuahua pine. Arizona cypress does not reproduce adequately in the absence of an exposed mineral soil seedbed, which fire helps to develop. In some locations a shrub layer covers up to 50% of the site. These shrubs may include pointleaf manzanita, catclaw acacia, birchleaf buckthorn, California buckthorn, silktassel, and sumac. Scattered perennial bunchgrasses such as muhly grass and pinyon ricegrass, as well as seasonal forbs, compose the open herbaceous layer.

As in the predominantly pine- oak mixture described above, more frequent fire is thought to have kept oak woodlands more open, with fewer trees, more grass, and fewer shrubs in the understory. The monument prescription for mixed oaks aims for 9–15 years between burns based on fire history studies in the monument (Swetnam et al. 1989; Baisan and Morino 1999).

Table III- 4 describes the generally overstocked condition of mixed oaks at the monument. This structural vegetation type also has the following characteristics:

- Condition class 2— fire frequency outside historic range and high fuel loads.
- Recent burns have decreased fuel loading, increased native grasses and forbs, decreased shrub cover, and slightly decreased density of pole- sized oak trees.
- Anderson (1982) fuel models for type:
    - Model 8: Forest with light litter and little understory. Litter and grass are the primary carriers of fire.
    - Model 10: Forest with heavy dead- down material loads; live understory. Litter and grass are the primary carriers of fire. Shrubs and saplings act as ladder fuels.
- S. pine bark beetle in Chihuahua and Apache pines throughout the park (including among oak stands) at roughly 10% infestation rate.
- Weeping lovegrass and tansy mustard are problem invasive non- native species.

Manzanita Shrub Community

Manzanita shrub community covers about 1,600 acres scattered through the monument in a mosaic mixture with oak woodlands (Figure III- 1). The dominant shrubs in this interior chaparral type have dense, compact crowns with small, thick, stiff evergreen leaves. Shrubs resprout or regenerate from heat- triggered seed germination post- fire

(Wright and Bailey 1982). Species such as pointleaf manzanita, mountain mahogany, and Wright's silktassel become large in the absence of fire. High- density stands of manzanita and low- growing oaks are thought to result from normal ecological succession, and stand- replacing fires are to be expected. The monument prescription for this chaparral type includes a time- since- last- burn of 20–50 years, based on Baisan and Morino (1999). These thick stands pose a problem for fire managers where residences, facilities, campgrounds, and interpretive areas were built in these vegetation types.

Table III- 4 describes the generally overstocked condition of manzanita shrub community at the monument. This structural vegetation type also has the following characteristics:

- Manzanita type falls into condition class 1 or 2: fire regime within (1) or moderately outside (2) historical range.
    - Class 1 areas have discontinuous fuel loadings because of substrate and/or past high- intensity burns.
    - Class 2 areas have high fuel loads and continuous canopy, with more grass between shrub clumps (muhly, three- awn, grama); pinyons and junipers are increasing; areas are sites of past low/ moderate- intensity burns.
- Recent burns:
    - In condition class 1, conditions have not changed.
    - In condition class 2, areas have decreased manzanita cover, increased native grasses and forbs, and decreased encroachment of pinyons and junipers.
- Anderson (1982) fuel models for type:
    - Model 5: Younger green stands with little dead material; live, but sparse, understory. Discontinuous fuel bed hinders fire spread.
    - Model 6: Older shrubs with flammable foliage; moderate dead material and litter. Grass present between shrubs creates continuous fuel bed under optimum environmental conditions.
- No insect or disease problems
- Lehmann and weeping lovegrasses are problem invasive non- native species.

Mixed Grasses with Minor Shrub- Tree Component

At the lowest elevations of the park that lie along the western edge, the grass- shrub community occupies about 1,000 acres. The area was grazed from the 1880s to 1960s and has also been subject to fire suppression, thus its original floristic composition is difficult to determine. Most workers conclude grazing and lack of fire in semi- desert grasslands encourage shrubs at the expense of grass (Wright and Bailey 1982). Time-since- last- burn for this type is 2–5 years in the monument prescription, based on Kaib et al. (1996).

Blue grama, hairy grama, slender grama, sideoats grama, and purple grama are the chief native grasses. Other grasses include bullgrass, wolftail, and Texas beardgrass. Shrubs and small trees may be present, including honey mesquite, catclaw, yerba de pasmo, silktassel, joint fir, sagebrush, and threadleaf groundsel.

Deliberately introduced Lehmann lovegrass is well established within the mixed grass type at Chiricahua and is the primary invasive non- native plant of concern to the fire program. The grass makes up 20–25% of the cover in monument grasslands. It is a drought- and fire- tolerant species whose spread is difficult to curb; the grass is mechanically removed around developed areas. The grass is present in the habitat that suits it and has limited potential of spreading to other areas. Eradicating Lehmann lovegrass is desirable. A goal for the mixed grass- shrub vegetation type is to restrict non- native plant species to less than 10% of cover composition within five years after any burn, using manual or mechanical removal if necessary. The key concern relative to this grass is that it burns at a higher temperature than native grasses and thus potentially damages Palmer's agave, a food plant for the endangered lesser long- nosed bat.

Table III- 4 describes the current condition mixed grasses with minor shrub- tree component at the monument. This structural vegetation type also has the following characteristics:

- Condition class 2— fire regime moderately outside historical range; fire could cause Lehmann lovegrass to increase at the expense of key ecosystem components.
- Recent burns have increased native grasses and forbs and decreased invasive woody species (native mesquite, acacia).
- Anderson (1982) fuel models for type:
    - Model 1: Fine, curing or cured, herbaceous fuels; no overstory trees or shrubs.
    - Model 2: Fine herbaceous fuels, curing or dead, with sparse clumps of shrubs or trees.
- No insect or disease problems.

Lehmann and weeping lovegrasses, camphorweed, hare barley, Johnson grass, longspine sandbur, and stinkgrass are problem non- native invasive species.

Sensitive Plant Species

While addressing the ecology and fuels situation relative to the four structural vegetation types, the fire program will also take care to protect the plant species listed in Table III- 5. These plants have special federal or state status. At the species level there is variation in the sensitivity to fire, and many plants benefit from fire during some stage of their life cycle. Nonetheless, there is no question that fire events can harm plants in the short- term. Appendix II describes each plant species in more detail.

Impact Topic 5 (Wildlife)
The absence of fire at Chiricahua National Monument has affected wildlife habitats by increasing shrub cover in grasslands and canopy cover in woodlands and forests. More frequent, low intensity fires in these habitats would increase browse for deer and other herbivores and return plant communities to historical diversity. However, there is no question that fire events can harm wildlife in the short- term. Wildlife concerns are similar on the ZOC under Alternative B.

Monument species lists name 9 amphibians, 46 reptiles, 173 birds (62 year- round residents), and 71 mammals. A number of Madrean species extend into the Chiricahua Mountains and other sky islands of the region. Visitors, particularly birdwatchers, come to the Chiricahuas hoping to see hepatic tanagers, olive and Grace's warblers, Arizona (Strickland's) woodpeckers, Mexican spotted owls, zone- tailed hawks, Mexican chickadees, juniper and bridled titmice, elegant and eared trogons, thick- billed parrots, and hummingbirds (Parent 1994; Southeastern Arizona Bird Observatory 2002). The monument lies within the normal geographical ranges of Anna's, black- chinned, blue-throated, broad- tailed, magnificent, and rufous hummingbirds. Lucky observers may see berylline, white- eared, and violet- crowned hummingbirds wandering up from Mexico on rare occasions.

The white- nosed coatimundi, a species in which females travel in big bands, is another monument resident popular with visitors. These gregarious raccoon relatives occupy tropical habitats throughout most of their range. Abundant lizards and snakes occur in the monument, and those in the know might come especially to see mountain spiny lizards, banded rock rattlesnakes, and beautiful Sonoran mountain kingsnakes.

Sensitive Animal Species
Table III- 5 lists species of concern found at Chiricahua in need of special protection under the fire program. These animals have special federal or state status, and their biology is reviewed in Appendix II. A Biological Assessment was prepared for the U.S. Fish & Wildlife Service (USFWS) to support this fire planning effort; the document addressed the five federally listed species in Table III- 5 but was primarily concerned with lesser long- nosed bat and Mexican spotted owl.

Table III- 5. Rare and Protected Species at Chiricahua National Monument
This list also covers special status species in the adjacent ZOC on the Coronado National Forest under Alternative B.

Species	ESA	USFS	BLM	WSCA	NPL
Accipiter gentilis Northern goshawk	SC	S		WC	
Falco femoralis septentrionalis Northern aplomado falcon	E				
Falco peregrinus anatum American peregrine falcon	SC	S		WC	
Strix occidentalis lucida Mexican spotted owl	T	S		WC	
Canis lupis baileyi Mexican wolf	E				
Leptonycteris curasoae yerbabuenae Lesser long- nosed bat	E				
Panthera onca Jaguar	E				
Apacheria chiricahuensis Chiricahua rock flower					SR
Astragalus cobrensis var. maguirei Coppermine milk- vetch	SC	S			SR
Carex chihuahuensis A sedge		S			
Echinocereus ledingii Pinaleno hedgehog cactus					SR
Graptopetalum bartramii Bartram stonecrop	SC	S			SR
Hedeoma dentatum Mock- pennyroyal		S			
Hexalectris spicata Crested coral root					SR
Hexalectris warnockii Texas purple spike	SC	S	S		HS
Perityle cochisensis Chiricahua rock daisy		S			SR

Federal ESA (Endangered Species Act)
- E=listed endangered
- T=listed threatened
- SC=species of concern (unofficial status)

USFS (Forest Service)
- S=sensitive (regional forester designation)

BLM (Bureau of Land Management)
- S=sensitive (state office designation)

WSCA (Wildlife of Special Concern in Arizona)
- WC=wildlife of concern

NPL (Arizona Native Plant Law)
- HS=highly safeguarded
- SR=salvage restricted

Impact Topic 6 (Unique Sites and Wilderness)
These natural features are unique or particularly noteworthy in the monument (see Figure I- 2):

- Large expanses containing the primary resource—pinnacles

Chiricahua National Monument is largely volcanic in origin. After a huge eruption 27 million years ago, successive layers of hot ash gradually cooled and welded together to form the rhyolite "tuff" that later fractured along fault lines and joints to form blocks. Some blocks were uplifted while others remained in place, resulting in magnificent columns up to 150 feet tall and 30 feet in diameter. Wind, rain, snow, and ice eroded columns into the unusual pinnacles—spires and balanced rocks—characteristic of the monument.

- Silver Spur meadow

Silver Spur Meadow lies northwest of the visitor center, southwest of the campground, and just north of Silver Spur Spring. The CCC camped on the site from 1934 to 1940, and at that time it was more of an open meadow than it is today. Currently there are interpretative signs at the site that describe the CCC era; little direct evidence is visible.

- Echo Canyon old growth forest patch

Echo Canyon runs northeast- southwest, from just below the Massai Point parking lot down to Rhyolite Canyon. Large, old Arizona cypress and Apache pine grow in the mile- long drainage above a creek that can flow spectacularly during the summer rainy season. Pinnacles, a Mexican spotted owl protected activity center (PAC), and abundant canyon treefrogs make the 30- acre swath of the monument a beautiful and important site.

- Relict Arizona cypress stands in Rhyolite and Bonita Canyons

Arizona cypress is much less common than the other major tree species in the monument (pines, oaks, Douglas- fir). The species is considered a relict from a wetter, cooler age, and is generally now confined to north- facing canyon slopes and drainages (Brown 1994). Parker (1980) found cypress on drier sites at elevations above about 6,000 feet, including in the Chiricahua Mountains. This tree occurs in the U.S. only in the Southwest, with a wider distribution in Mexico. Cypress is patchily distributed within the monument; large specimens of this handsome evergreen occur in canyon bottoms.

- Springs in drainages and Headquarters Spring upslope from the visitor center

Springs are the only permanent water in the monument. A number of plants on the monument's list only occur at these sites, and wildlife depends on them, especially when creeks are dry.

- Canyon- bottom riparian habitat

These areas are especially important for the monument's birdlife. The best examples of this deciduous woodland habitat are found in mesic sites in Bonita Canyon. Dominant trees include Arizona sycamore, Fremont cottonwood, Arizona ash, Arizona walnut, willow, and black cherry.

- Designated wilderness

Eighty- six percent of Chiricahua National Monument is designated wilderness; wilderness areas are located outside of developed corridors in all parts of the monument. Within the wilderness, trails are the only visitor facilities, and neither motorized vehicles nor camping are permitted. The quiet, solitude, and minimum human influence in the wilderness provide visitors with a unique experience. Coronado National Forest also has a designated wilderness area six miles south of the monument. The riparian area and perennial pools along Indian Creek on the east boundary of the ZOC are special features that require consideration in planning for fire activities. The ZOC lies outside the designated Chiricahua Wilderness Area.

Impact Topic 7 (Erosion/Debris Flow)

A recent soils report (Denny and Peacock 2000) names 13 soils and defines 24 map units for the monument. The soils are typically weakly developed and shallower than 10 or 20 inches to slightly fractured, mostly rhyolitic tuff bedrock. Deeper soils are limited to depressional and lower slope positions and alluvial bottoms. They occur mostly on relatively steep slopes and subject to runoff discarded from adjacent rock outcrops. Since these soils tend to have relatively high surface soil rock contents they are less susceptible to sheet and rill erosion. The nature and amount of effective ground cover, including that provided by live and dead vegetative matter, can strongly affect erosional processes. Fire induced soil water repellency is also a concern. There is evidence of mass wasting (debris flows) at various locations in the monument.

Approximately 3,900 acres have been treated with fire and another 32 acres mechanically treated since 1975. The existing trends and conditions of the vegetation types in remaining areas of the park have ramifications in terms of current erosional and hydrologic processes. Currently all the vegetation types proposed for treatments are experiencing an increase in woody plants and their litter at the expense native grasses and forbs. The resulting ground cover, although effective in the short- term, is vulnerable to complete consumption especially in response to severe wildfires. In addition less water is available to the soils and streams. This scenario is supported by anecdotal evidence that Rhyolite and Bonita Canyons once supported perennial flows. In recent years both streams have carried surface flows for a maximum of 5 months each year. In addition, heavy dead and down fuel loadings are associated with the "pine with mixed conifer and hardwoods" and "mixed oak community" vegetation types. Excessive manzanita cover has been identified within these vegetation types and the "manzanita shrub community". These fuel conditions increase the risk of fire- induced water repellency and other soil damage, which can slow post- fire vegetative recovery.

The increasing competition from non- native plants in the "mixed grasses with minor shrub/tree component" also may have soil erosion implications.

Canyons are steep, with substantial rock outcrops and shallow soils. The canyon bottoms have deep alluvial soils, which provide the most mesic environments. Although stream channels are scoured by runoff from summer storms, the adjacent higher terraces are typically covered with heavy deposits of litter and support stands of oak, pine and Arizona cypress. These soils have a greater capacity to retain and gradually release water than those associated with the uplands.

Perennial streams are not found within the park. During the summer monsoon season, and at times following heavy winter rains or snowfall melt, intermittent and ephemeral streams carry large volumes of runoff for brief periods. Sustained surface flows in Rhyolite and Bonita Creeks may occur during the summer monsoon with the former sometimes flowing for several months and the latter more intermittently. In August 1993 and 1999 major storms produced 100- to 500- year floods in both Rhyolite and Bonita Creeks, causing substantial damage to roadways and a campsite.

Several springs exist with some being permanent and dependable supplies for wildlife. The current vegetative trends and conditions have implications to the long- term maintenance of these critical riparian and spring systems.

Impact Topic 8 (Air Quality)
Chiricahua is designated a Class I Federal area, which requires the strictest enforcement of air quality regulations. Chiricahua personnel have the duty, as defined by the Clean Air Act, to protect park resources from air pollution- related effects and damage. Burn prescriptions must comply with all Federal, state, interstate, and local air pollution standards. The State has authority in establishing air quality standards and permitting requirements. An Arizona Department of Environmental Quality Burn Permit is required that details predicted smoke and particulate emissions.

Air quality is generally excellent for the monument. Air influences all other natural resources and is of great importance in all management considerations. A recording station was established at Chiricahua in 1988 to monitor acid deposition, ozone, and visibility. The ZOC and monument are part of the same airshed. Vegetation types present are normally not big smoke generators when burning.

Chapter IV: Environmental Consequences

This chapter evaluates the environmental consequences of the three alternatives retained for consideration in Chapter II.

Methodology
Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site- specific, local, or even regional?), duration (are the effects short- term or long- term?), timing (is the project seasonally timed to avoid adverse effects?), and intensity (are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this Draft Environmental Impact Statement.

The three fire management alternatives differ mainly in their application of wildland fire use. The framers of these alternatives envision the No Action Alternative (continuing the direction of the 1992 plan) to result in the most suppression and highest risk of future conflagrations because this alternative provides for the least wildland fire use. Alternative A automatically suppresses fire in the developed corridor and along the boundary, leaving wildland fire use available as an option to help reduce the incidence of future large- scale fires throughout most of the monument. Alternative B takes A a step further, and by including areas outside the monument boundary, it theoretically can reduce both future wildfires within the monument and those that might travel in from USFS land. Acres under wildland fire use thus range from 2,000 under No Action, to 11,685 under Alternative A, and 16,985 under Alternative B.

There is no way to know what would actually happen, but each alternative could conceivably have a very similar outcome. Since the development of the 1992 plan, no monument fire has met the strict go/ no- go criteria that allow wildland fire use. Within the past 10 years, a single ignition meeting the environmental parameters of the wildland fire use prescription under the 1992 plan occurred just outside the fire use FMU, so it had to be suppressed. This single event is the basis for a prediction of one wildland fire use event over a 10- year planning period for this analysis. The same schedule of prescribed burning within the monument would apply to all three alternatives. Thus, it is possible that the actual program outcome could be the same mixture of suppression and prescribed fire/thinning for all three alternatives, with the expansion onto the Coronado National Forest in Alternative B as the only major difference.

In order to conduct this chapter's analysis the IDT assumed that there would be wildland fire use in increasing amounts (due to less restrictive go/ no- go criteria) and suppression in decreasing amounts looking across the range of No Action- Alternative A- Alternative B. The amount of prescribed fire would likely be the same for No Action and Alternative A, with increased burning in the USFS ZOC under Alternative B.

Impairment
In addition, National Park Service's *Management Policies, 2001,* require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the Environmental Consequences section for natural and cultural resource topics.

Cumulative Impacts
The Council on Environmental Quality defines *cumulative effect* as "the effect on the environment that results from the incremental effect of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non- Federal) undertakes such action" (40 CFR § 1508.7). Assessment of cumulative effects is based on a scenario for the monument developed by the IDT. It includes:

- main road resurfacing in the spring and summer of 2002
- utilities replacement in the spring and summer of 2002
- 5- year (2000- 2005) trail improvement project

- past and future (beyond FMP tenure) prescribed burns, wildland fire use, and non-fire treatments at the monument
- past and future fire suppression activities on the monument
- replacement of the monument's septic system in 2008
- 1993, 1999, and future floods
- ongoing increase in cover and density of woody species
- ongoing regional drought and insect outbreaks
- ongoing colonization of exotic plants and management activities over the tenure of the FMP
- ongoing education programs over the tenure of the FMP
- ongoing weathering and exposure of cultural resources
- quarry activities 10 miles northwest of the monument that affect area air quality
- grazing on USFS land near the monument
- wildland and prescribed fire and thinning on USFS land in the Chiricahua Mountains over the tenure of the FMP and beyond
- fire suppression activities on USFS land in the Chiricahua Mountains over the tenure of the FMP and beyond
- future development and subdivision of ranchlands on the west side of the monument

For each impact topic, the IDT discusses how the monument's fire program under each alternative, in combination with these actions and other everyday operations, affects the impact areas.

The direct, indirect, cumultative effects analyses and impairment determinations are based on the literature and experience of National Park Service professionals and others knowledgeable about the monument and the issues. Measures to minimize or mitigate potential environmental effects of alternatives are presented.

Sustainability and Long- term Management
Following the analysis of the effects of the alternatives for each impact topic, the sustainability of the alternatives is reviewed. Specifically, we examine whether the alternatives are environmentally sustainable over the long- term, whether there will be a long- term or permanent effect on park resources, and whether there will be major impacts that cannot be avoided or mitigated.

Appendices
Appendices to this chapter include a summary of fire effects on vegetation (Appendix IV) and a cultural resources matrix (Appendix VI) prepared as part of the Cultural Resources Component for evaluation by the Arizona SHPO. These documents address impacts to (1) dominant plant species, (2) threatened and endangered species, and (3) cultural resources, respectively.

Impact Topic 1 (Life and Property)

Background and Methodology
Fire is a threat to the public, firefighters, monument staff, and developed areas; adverse effects could include respiratory problems or injuries, loss of structures, and, in extreme circumstances, loss of life. Fire is also an effective tool for reducing hazard fuels; a benefit of lowering fuel loads would be a reduced risk of severe fire and associated adverse effects.

The most important objectives for fire management are the protection of life, property, and resources from the unacceptable effects of wildland or prescribed fire. Life and property encompasses monument staff, firefighters, and visitors as well as park developments and personal property of everyone concerned. Life and property on neighboring lands are also of concern. Following procedure, staying within prescription, and allowing only a small percentage of the monument to burn at any given time are key methods of protecting life and property from negative effects of fire management operations.

The alternatives represent strategies from (1) maximum suppression in the short- term that comes with increased danger of catastrophic fire from accumulated fuels to (2) more fire in the short- term with less danger in the long- term. Thinning efforts during 1992- 2002, guided by the Wildland/Urban Interface Prescribed Burn Plan, have contributed to reducing potential impacts to park developed areas under all alternatives. Fuel reduction programs have been successful at preventing damage and loss; people management practices during fire operations have circumvented injury and loss of life.

Assessment of effects of alternatives on life and property is based on experiences to date. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: Life and property would not be affected, or the effects would be barely detectable and would not have an appreciable effect on life and property.

Minor: The effect would be detectable and would likely be short- term, but would not have an appreciable effect on life and property. If mitigation were needed, it would be relatively simple and would likely be successful.

Moderate: The effects would be readily apparent and long- term, and would result in substantial, noticeable effects to life and property on a local scale. Mitigation measures would probably be necessary and would likely be successful.

Major: The effects would be readily apparent and long- term, and would result in substantial, noticeable effects to life and property on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Short- term: Within the duration of a specific fire program activity (for example prescribed burn or suppression action).

Long- term: Beyond the duration of a specific fire program activity.

Impacts of No Action Alternative

Impact Analysis
Under the No Action Alternative, existing monument safety procedures would continue to be implemented to ensure the safety of park visitors, staff, and the local ranchowners. All wildland fires outside of the fire use area would be suppressed, and strategies would be in place to minimize risks to wildland firefighters and property.

Safety impacts resulting from fires would be directly related to season, severity, and fire location. Threats to life and property peak in the late spring due to early onset of the fire season as well as peak visitor use in March- May. Fires originating near high visitor use areas would have a moderate to major direct adverse impact to life and property. During fire suppression, firefighters would be engaged in such activities as evacuations, fireline construction, and aerial fire suppression. These activities inherently involve some risk to public health and safety; however, timely initial attack and suppression of small fires would produce minor and short- term impacts to life and property.

With the buildup of fuel that would occur under this alternative, there would be a greater potential for high intensity fire behavior in the long- term, which would increase risks to the safety of the firefighters and monument personnel. Health of nearby ranchowners would be a concern due to indirect impact of smoke exposure. Direct impacts, including injuries and possible loss of life and property, may also occur. Current management practices would generally result in minor to moderate, short- and long- term adverse impacts to life and property, although the possibility of high intensity wildland fire could cause long- term impacts to increase.

Prescribed fire would cause minor to moderate short- term, direct adverse impacts to life and property based on proximity of prescribed fire to developed areas and areas of high visitor use; however, long- term, direct adverse impacts would be decreased due to fuel loading reduction around these areas. Mitigation measures for prescribed fire include project planning with safety of firefighters and visitors as a priority, prescribed burning and hazard fuel reduction activity implementation around developed areas and high visitor use areas in the off season (before March and after September), implementing current monument safety procedures during all phases of operations, and providing public education and notification.

Cumulative Effects
Actions affecting life and property at Chiricahua National Monument include the monument's daily operations, the continued fire management practices within the

monument as well as on adjacent US Forest Service land, the risk of flood/mass transport debris events after high intensity wildland fires, and the monument's maintenance projects such as road improvements. Combined with the No Action Alternative, cumulative, minor to moderate, adverse impacts would be expected. In the long- term, the limited level of fuel reduction and interagency coordination with fire planning would pose a risk to life and property.

Conclusion
Implementation of the No Action Alternative would result in minor to moderate, short-term and long- term, adverse impacts. Major, adverse effects could occur if fuel buildup reaches levels that could support a high intensity wildland fire.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
Contrasted with the No Action Alternative, wildland fire use fires under Alternative A would be allowed to burn over a greater area of the monument; however, under both alternatives, no fires would be allowed to cross monument boundaries. Alternative A would decrease the potential for high intensity and widespread wildland fires due to a greater reduction of fuels as compared to the No Action Alternative. Life and property impacts would be reduced to create an indirect benefit in the long- term.

The actions involved with wildland fire use, prescribed fire, and mechanical fuel reduction would involve planning for the protection of life and property as well as appropriate notification and permitting prior to action. Also, similar to the No Action Alternative, prescribed fires and fuel reduction activities would be planned for seasons of low visitor use whenever possible. Suppression of fires along the boundary may increase safety risks to firefighters. Fires would be confined within or excluded from the monument, and topographic features beyond boundaries could not be used to contain fires more safely. Therefore, potential for adverse impacts related to fire suppression, prescribed fire, smoke production, and use of chainsaws and equipment would result in negligible to moderate, adverse, short- term impacts that are often very localized, with few off- site adverse life and property concerns to nearby ranchowners.

Cumulative Effects
Cumulative adverse impacts to life and property under Alternative A would be incrementally less than under the No Action Alternative. Additional fuels reduction over time would reduce the potential for widespread or high intensity wildland fires, resulting in a beneficial effect. Adverse impacts relating to firefighting and fire and fuels management activities would be minor to moderate.

Conclusion

Implementation of Alternative A would result in more localized, negligible to moderate, short- term adverse impacts. In the long- term, there would be beneficial consequences to life and property from the increased protection from high intensity wildland fires.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
The impact analysis for Alternative B is similar to Alternative A, except that Alternative B also includes approximately 5,300 acres of US Forest Service land. This provides added opportunity to reduce fuels within and adjacent to the monument and added protection from severe fires migrating across park boundaries. And, since the park boundaries would be transparent with regard to fire, firefighters engaged in suppression activities could use natural fire breaks within the ZOC to confine and contain fires. This would greatly reduce safety risks to firefighters as compared to the No Action Alternative and Alternative A.

Grazing permittees, hunting camps in and around the ZOC, and local ranchowners would be notified of fire management activities at Chiricahua National Monument. In the long- term, expanding fuels management activities into the ZOC will reduce adverse effects from severe fire. This will benefit those who utilize the ZOC or own lands adjacent to the area.

Cumulative Effects
Cumulative effects for Alternative B are similar to Alternative A, but include additional safety concerns for recreational vehicle users, and concentrated multiple hunting camps within and around the ZOC. Risk of flood/mass transport debris events is reduced from implementation of wildland fire use within the monument.

Conclusion
Implementation of Alternative B would result in more localized, negligible to minor, short- term adverse impacts from the fire and fuels reduction activities expected, but would also provide long- term beneficial impacts to life and property resulting from the increased protection from high intensity wildland fires.

Irreversible/Irretrievable Commitments of Resources
Under all alternatives, there would be a risk of irreversible or irretrievable commitment of life and properties (such as irreplaceable historic structures). This risk is offset by strategic fuels treatments that reduce the long- term potential for catastrophic fire and that provide adequate defensible space around vulnerable resources. In light of this, the No Action Alternative is the least protective of life and property; Alternative B, the most protective; and Alternative A, the intermediate between the two.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain

The various fire management alternatives differ in the amount and geographic extent of fuel treatments; and, as previously stated, reducing fuels can offset adverse impacts to life and property. The No Action Alternative is the most limited in terms of fuel reduction, followed in order by Alternatives A and B. Additionally, under the No Action Alternative and Alternative A, fires would be suppressed along the boundary which would result in increased safety risks to firefighters. Accordingly, Alternative B provides the greatest long- term reduction of risk to life and property.

Unavoidable Adverse Impacts
It is likely that under the No Action Alternative, large catastrophic fires could not be avoided in the long- term. Because Alternatives A and B more aggressively treat fuels and, in turn, limit the potential for catastrophic fires, implementation of these alternatives would reduce potential adverse effects to life and property, with Alternative B providing the greatest reduction of risk.

Impact Topic 2 (Visitor Experience and Tourism)

Background and Methodology
Potential restrictions on access to burning areas, road closures, traffic, and smoke can alter visitor experience and cause tourists to avoid the area; but the fire program also provides interpretive and economic opportunities.

Visitors can be temporarily affected by smoke that may degrade scenic views, or by campground, trail, and road closures that restrict access to the active fire zone. Restrictions might divert tourists from the area; multiple alternate destinations are available close by (see Table III- 2). The bed and breakfast establishment adjacent to the park is a less pleasant lodging when fire is present in and around the monument due to smoke and helicopter noise. The intensity of effects would vary according to extent and severity of a fire event, and the immediate perceived threat to safety. There may be long- term effects on park visitation as potential visitors may be disinclined to visit a burned landscape if other options for outdoor recreation are available. A benefit to visitor experience and local tourism may result from a reduction of high- intensity, widespread fire potential over time. Any impact to visitor experience varies according to fire and weather conditions. Since 1975, 41 prescribed burns have occurred at the monument, burning approximately 3,900 acres.

Park staff diligently communicates with visitors regarding fire management actions and scheduled prescribed burns. Information concerning prescribed burns is provided to local newspapers, radio stations, and to neighbors within five miles of the monument. During a prescribed burn, timely information is available at the visitor center and entrance station, and staff provides interpretive and safety- related information to visitors. Interpretation and visitor education play a key role in prescribed burn activities, but the monument could take greater advantage of interpretive opportunities produced by fire program activities.

For each alternative under consideration, prescribed burning is a major component. Wildland fire use plays a greater role for Alternatives A and B than for No Action. Because natural ignitions must meet burn prescriptions and safety- related criteria, the effects of wildland fire use on visitor experience and tourism are not expected to differ from those resulting from prescribed burns. Monument officials can plan specifically for prescribed burns, although they must have a plan in place for accommodating visitors during unpredictable suppression and wildland fire use activities. No natural ignition has yet satisfied wildland fire use decision criteria under the 1992 FMP.

Fire events can increase revenues to local suppliers of lodging, food and other basic services in the short- term, making up for lost tourist revenues. However, over the long-term, widespread high intensity fires that destroy natural and cultural resources would greatly diminish revenues to the park as tourists choose alternate destinations.

Staff considered past experience with visitors during fire events and general knowledge of visitor patterns and expectations to determine impacts. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: The impact on visitor experience and tourism is at the lowest levels of detection.

Minor: The impact is slight but detectable and would affect few visitors and tourist- oriented businesses in the area.

Moderate: The impact is readily apparent and would affect many visitors and tourist-oriented businesses in the area.

Major: The impact is widespread or locally unavoidable and would affect most visitors and tourist- oriented businesses in the area.

Short- term: Within the duration of a specific fire program activity (for example prescribed burn or suppression action).

Long- term: Beyond the duration of a specific fire program activity.

Impacts of No Action Alternative

Impact Analysis
Under the No Action Alternative, visitor use and tourism would be subject to few, if any, adverse impacts until a fire occurred within or near the monument. Then, suppression activities and the fire itself would disrupt public enjoyment and use of the monument for the duration of the fire, and possibly for an extended period after extinguishment, if the fire is widespread and of high intensity. Minor to moderate, short- term, adverse

impacts would include loss of access to the burned areas of the monument and possible temporary loss of revenue of business in the local communities. Additional restrictions on the use of certain facilities, depending on the location and severity of the fire, would be a possibility.

Fire and the associated suppression efforts would affect areas more heavily used by visitors—the historic Faraway Ranch District, Bonita Campground, Massai Point, the Visitor Center area, Echo Canyon, and the trail system—by directly causing unsafe conditions resulting in full or partial monument closure, or by causing smoke, noise, traffic, or decreased visibility that would detract from the visitor experience in or near the fire area. Although specifically prohibited in wilderness areas, the use of helicopters and air tankers for suppression activites could temporarily detract from the experience of visitors in nearby wilderness areas. The No Action Alternative would result in short-term, direct, minor to moderate adverse impacts to visitor use and tourism, with possible minor to moderate, indirect long- term impacts if areas cannot be used or fully experienced after the fire due to the presence of burned landscapes, hazard trees, or severely eroded areas.

Over the long- term, the No Action Alternative would increase the possibility of extensive and widespread wildland fire due to the expected buildup of fuels from a suppression program. A more extensive wildland fire would be likely to occur during the late spring and early summer months and last for an extended period of time. This may cause a short- term, minor to moderate adverse effect to visitor experience due to extended closures and a long- term, moderate to major adverse effect due to changing and/or damaging the natural and cultural resources that attract visitors to the monument. However, a long- term, moderate indirect benefit to implementing a fire program would be the opportunity to conduct education and interpretation programs related to fire management.

Cumulative Effects
Activities that affect visitor use and experience include fire and firefighting activities in the monument, other maintenance projects in the monument, such as the ongoing trail and septic system work. Cumulative adverse impacts would range from minor to moderate, with some possibility of major impacts if extensive wildland fire damaged much of the high visitor use areas of the monument during the peak tourist season.

Conclusion
Implementation of the No Action Alternative would result in minor to moderate, short-term impacts to visitor use and tourism, with the possibility of major short- and long-term impacts in the event of a widespread wildland fire.

Impacts of Alternative A (Corridor Plan)

Impact Analysis

Compared to the No Action Alternative, Alternative A would decrease the chance of extreme wildland fires in the area due to the reduction of fuels in the monument by more extensive utilization of wildland fire use. This would result in a long- term, indirect, moderate, beneficial effect to visitor use and enjoyment, since the possibility of a large- scale fire event causing damage to natural and cultural resources, smoke, and noise would be substantially reduced. Also, avoiding destructive wildland fire events and associated disruption to visitors during the peak visitor use season would increase the beneficial effects of this alternative.

Prescribed fires and thinning activities would generally be undertaken in limited areas in the off- peak visitor use season when fire danger is lower and fewer visitors are present. Also, prescribed fire activities and pile burning would be accomplished when climatic conditions are appropriate to ensure that smoke would not interfere with visitor experience or cause major, indirect adverse impacts to viewsheds. During any of these activities, frequent visitor use restrictions and disturbances may occur due to smoke, noise, and heavy vehicle use. However, these impacts would be short- term and localized. Mitigation measures would be employed, such as notifying the public of fire activities, interpreting ongoing fire activities, and providing interpretive activities that are alternatives to the traditional visitor experience. Overall, the adverse impacts on visitor use would be minor to moderate and short- term.

Cumulative Effects
Activities affecting visitor use and experience include those that could result from the monument's fire management actions, the fire practices within the surrounding national forest, which allows for suppression and prescribed fire activities, and the monument's maintenance projects. However, because of increased fuels reduction and expanded use of wildland fire use under this alternative, fewer extensive wildland fires would occur long- term. Therefore, the cumulative effect would be short- term and minor.

Conclusion
Implementation of Alternative A would result in minor to moderate, short- term adverse effects during periods of fuels reduction, prescribed fire, and suppression activities that would call for restrictions on monument use. However, long- term beneficial effects would result from increased protection from extensive wildland fires and resultant landscape scene.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
The impact analysis for Alternative B is similar to Alternative A, except that Alternative B also includes approximately 5,300 acres of US Forest Service land. This provides added opportunity to reduce fuels within and adjacent to the monument and added protection from severe fires migrating across park boundaries. And, since the park boundaries would be transparent with regard to fire, firefighters engaged in suppression activities

could use natural fire breaks within the ZOC to confine and contain fires. This could reduce the level of effort and staff needed to suppress fires as compared to the No Action Alternative and Alternative A.

Grazing permittees, hunting camps in and around the ZOC, local ranchowners, and camping/hiking parties using the ZOC would be notified of fire management activities at Chiricahua National Monument. In the long- term, expanding fuels management activities into the ZOC will reduce adverse effects from severe fire. In the long- term, this would benefit those who recreate in the ZOC or on lands adjacent to the area.

Cumulative Effects
The cumulative impact analysis for Alternative B is similar to Alternative A, except that Alternative B includes trail- building, road grading, other minor maintenance activities related to outbuildings in the ZOC, and potential forest- wide closures in extreme fire danger conditions.

Conclusion
Alternative B will result in minor to moderate, short- term adverse impacts to visitor use and tourism both within the monument and the ZOC. Long- term, major, beneficial effects would result from fuel reduction, prescribed fire, and fire use activities that would improve the viewshed for visitors to the monument and the ZOC.

Irreversible/Irretrievable Commitments of Resources
There would be no irreversible/irretrievable commitments of visitor and tourism resources. Visitor experience may be affected under all the alternatives, but visitation should not be irreversibly or irretrievably affected.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain
In the short- term, the alternative with the greatest fire activity would cause the most inconvenience to visitors (Alternative B). This, however, would be offset in the long-term by providing a reduced risk of catastrophic fires and associated large- scale suppression activities. Also, when fire must be limited to artificial boundaries (or to those boundaries that do not naturally confine fires) such as in Alternative A and the No Action Alternative, more aggressive suppression actions to contain unplanned fires would be warranted in the short- term. Under this management scenario in the long-term, fuels buildup would occur to a greater degree along the boundary, promoting more intense fires. This condition would contribute more to visitor disruptions than the short- term inconveniences imposed by Alternative B.

Unavoidable Adverse Impacts
Under all alternatives, adverse impacts to visitor experience can be effectively mitigated. Viewshed effects are expected to recover, long- term.

Impact Topic 3 (Cultural Resources)

Background and Methodology
Cultural resources, including historic structures, landscapes, and artifacts, are subject to adverse effects that primarily result from exposure to flames, heat, and smoke as well as ground disturbance from suppression activities or post- fire erosion (Jones and Euler 1986; Lentz et al. 1996; Traylor et al. 1990). These effects are not generally reversible; historic wooden structures do not "grow back" after a fire to become what they were before, and disturbed lithic and ceramic scatters do not rearrange themselves into their original positions. Thus it is important that the fire program be designed to avoid impacts to cultural resources. Cultural landscapes may be restored and even enhanced by fuel reduction activities; they may also be degraded irreversibly. Strategic fuel treatments can protect cultural resources from direct contact with fire.

The literature primarily contains analyses conducted after wildland fires and a few experimental studies conducted as part of prescribed burns; it is not a surprise that intensity of impacts increases with temperature and duration of the fire. Lentz et al. (1996), in their study of impacts to archeological resources following the Henry Fire in New Mexico, recorded substantial fire effects of artifacts under all fire intensities. The recorded damage to artifacts was as deep as 20 cm subsurface. Fuel loading was the critical variable in the severity of these effects.

Appendix VI is the cultural resources matrix prepared for the NHPA Section 106 consultation. The cultural resources matrix is a key section of the Cultural Resources Component, a compliance document submitted to the Arizona SHPO. The office concurred with our findings on May 1, 2003. Though approximately 3% of the park has been inventoried for cultural resources (NPS 2001 – GMP), undescribed sites are highly likely to fall into matrix categories. Priorities include minimizing ground- disturbing suppression activities and removing fuel loads to reduce effects of fire on known archeological resources and historic properties. In the long- term, it is believed that cultural resources may benefit from the reduced risk of high- intensity, widespread wildland fire, which has a much greater potential to undermine the integrity of such resources.

The matrix identifies resources, risks, and mitigation measures to minimize impacts, and was compiled from the literature and collective experience of management, fire, natural resource, and cultural resource staff of Chiricahua National Monument, the NPS Southern Arizona Office, and the NPS Western Archeological Conservation Center.

The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: Impacts would be barely perceptible changes in significant characteristics, either positive or negative, of historic properties, archeological sites, and cultural landscapes.

Minor: Adverse Impact—Impacts would either be little loss of significance or integrity and the National Register eligibility of the site unaffected, or be perceptible and noticeable, but would remain localized and confined to a single element or significant characteristic of historic properties, archeological sites, or cultural landscapes (such as a single archeological site containing low data potential within a larger archeological district or a single contributing element of a larger historic district). For purposes of Section 106, the determination of effect would be *no adverse effect*.

Beneficial Effect—Maintenance and preservation of a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Adverse Impact—Impacts would be sufficient to cause a noticeable but not substantial change in significant characteristics or integrity of historic properties, archeological sites, and cultural landscapes, but would not jeopardize its eligibility for listing on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial Effect—stabilization of a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Major: Adverse Impact—Impacts would result in substantial and highly noticeable changes in significant characteristics and integrity of historic properties, archeological sites, and cultural landscapes that would jeopardize its eligibility for listing on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Beneficial Effect—active intervention to preserve a site. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Impairment: A major, adverse impact to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents.

Impact Duration Definitions (Short- and Long- term):

Duration of impacts to cultural resources from fire activities is not usually considered under the National Historic Preservation Act. Most direct

effects to resources are adverse and permanent. However, landscapes may well recover and even benefit from the effects of fire and fuel reduction.

Impacts of No Action Alternative

Impact Analysis
The No Action Alternative would continue fire exclusion and suppression of ignitions in most of the monument, with a small fire use area and limited prescribed burning. Fuel loading within the monument and along the boundaries would continue to increase. Continued suppression would lead to continued lack of more frequent, less intense wildland fires, and an increase in severe wildfires would be likely. Wildland fire effects could be extensive if higher intensity fires occurred because of the higher heat and longer residency time, resulting in greater heat penetration deeper into the soil and complete wood consumption. Fire effects could include cracking and flaking of stone or concrete foundations, alterations of landscapes, and burning of flammable resources.

The potential for ground- disturbing suppression activities would likely result in greater damaging, direct effects, such as exposure of sites or artifacts through removal of concealing vegetation. Indirect effects from erosion and vegetation loss could be less during periods of effective suppression but may be greater following high- intensity wildfires. Higher heat temperatures could alter surface artifacts. And, of course, high intensity wildland fires could carry the risk of damaging or completely destroying historic structures.

Careful and considered placement of hand lines could reduce the potential for disturbance, but the ability to do this is greatly reduced during an intense wildland fire.

Given the higher potential for more intense wildland fire into the future, the No Action Alternative would result in minor to moderate, direct and indirect adverse impacts to cultural resources.

Cumulative Effects
The surrounding Coronado National Forest may also be expected to contain unidentified cultural sites. The No Action Alternative would be expected to add to the cumulative impacts of cultural resources over a broader area from the actions of fire suppression, wildland fire use, and prescribed fire within the monument. Cultural resources may also be impacted through natural and human- caused erosion, illegal collecting, damage from vegetation growth, and other ground- disturbing activities. Negative cumulative effects include unknown impacts of a recent road resurfacing and utilities replacement (ground disturbance on approximately 9 acres, primarily in the developed area in Bonita Canyon); ongoing historic trail preservation project; future septic system replacement; past and future prescribed burns; large, high severity fires in the Chiricahua Mountains that reach the monument; and previous and potential future fire suppression operations. Impacts of the No Action Alternative, combined with other

past, present, and future activities, would result in minor to moderate, long- term adverse impacts on cultural resources from fire, collection, erosion, and soil- ground disturbance.

Conclusion
Overall, the No Action Alternative would result in moderate direct and indirect impacts to cultural resources. Moderate cumulative impacts resulting from successive suppression actions are expected. This alternative holds the greatest potential, with its continued suppression over most of the monument, for negative impacts to cultural resources in the long- term, particularly damage to flammable historic structures.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
The strategies of wildland fire use for resource benefit and the use of a combination manual/mechanical treatment and prescribed fire application would result in an expected decrease in the number of suppression actions and also a decrease in large, intense wildfires. Disturbance from the action of work crews, slash pile burning, removal of individual trees, and thinning/limbing would result in localized, direct, negligible to minor effects. Mitigation measures include surveys in advance of prescribed burns and fuel reduction projects with appropriate planning of line location, pile location, and briefing of crews for resource sensitization. However, wildland fire use may result in fire events of greater duration and extent than prescribed fire. With the wildland fire use FMU encompassing all but 300 acres of the monument, required suppression actions on fires would be less frequent, and would result in minor to moderate short- term, direct adverse impacts as more fire use fires are allowed to burn. Continued suppression of fires within the 300- acre corridor would cause minor to moderate, short- term, direct adverse impacts to unidentified surface and buried artifacts in direct relation to fire intensity and suppression activities. Potential for indirect adverse impacts would decrease over time with reduction in fuel load, resulting in minor beneficial effects.

Cumulative Effects
Cumulative effects under Alternative A would be similar to those in the No Action Alternative except for fewer impacts from suppression activities.

Conclusion
Under Alternative A, the direct, adverse impacts to cultural resources would be minor to moderate and localized, but there would be minor to moderate beneficial impacts to landscapes through a return to a more natural and historic appearance by the presence of prescribed fire and wildfire.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
The impacts of Alternative B are the same as for Alternative A, except that Alternative B includes 5,300 acres of US Forest Service land, in the ZOC. Prescribed fires and wildland fire use fires would be larger and would cause similar but more widespread effects than in Alternative A. Effects of suppression actions would be minimized due to use of natural barriers both for prescribed burns and for wildland fire use fires. Fuels would be reduced on a larger area, and would therefore reduce adverse impacts of a wildland fire burning in the monument. In general this alternative would be expected to have the smallest potential for disturbance to cultural resources as a result of suppression actions. Indirect impacts would be reduced resulting in minor to moderate, beneficial effects.

Cumulative Effects
Cumulative effects are the same as for Alternative A except that this alternative would produce the fewest expected negative impacts from suppression activities.

Conclusion
The effects of Alternative B would be the same as Alternative A, except that it includes an additional 5,300 acres of land. Fire management actions within the ZOC would further lessen the potential adverse effects of future wildfire events, particularly those originating from outside the monument.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments of Resources

Irreversible or irretrievable commitments of cultural resources could result from loss of the resource (such as a historic structure), irreparable damage to the resource, or illegal collection of the resource (such as archeological resources). These situations could occur under all alternatives; although cultural resources would be most vulnerable to loss and damage in the event of a catastrophic fire. The risk of catastrophic fire is most reduced under Alternative B, followed by Alternative A and the No Action Alternative.

Loss in Long- Term Availability Or Productivity Of the Resource to Achieve Short- Term Gain
Alternative B, which provides the greatest reduction of risk of catastrophic fire, would be the most protective of cultural resources in the long- term. In the short- term, however, Alternative B compared to Alternative A and the No Action involves the most fire and fuels management activity which could increase exposure of some cultural resources to collecting (such as archaeological resources) or to direct contact with fire. However, under Alternative B, there would be fewer negative effects from aggressive suppression activities in the short- term. Mitigation would be employed to offset adverse effects.

Unavoidable Adverse Impacts
The potential for adverse impacts to cultural resources exists under all alternative fire management scenarios. Mitigation measures would be implemented to avoid or reduce these effects.

Impact Topic 4 (Vegetation)

Background and Methodology
Fire would kill and injure some plants in the short- term and benefit many species in the long- term.

The fire management program at Chiricahua National Monument intends to have a substantial beneficial effect on vegetation over time. All three alternatives will attempt to push monument vegetation (that is primarily in condition class II, moderately displaced from the natural fire regime) toward condition class 1 (within the natural fire regime) through the use of prescribed fire and wildland fire use. Very little thinning (3 acres total) is proposed over the tenure of the new plan. It has taken decades to alter the fire regime in the Chiricahua Mountains, and it will take time beyond the planning period discussed here to effect condition class changes. The proposed fire program (through the year 2012) will very likely not move any area into condition class 1. Prescriptions and objectives have been designed to gradually reduce fuels and overstory tree and shrub canopies and densities such that areas can again accept regular fire without experiencing long- term adverse effects. The most noticeable change is expected where manzanita has invaded grasslands at lower elevations within the park. Fire is expected to reduce

manzanita and return these areas to native grassland. This case is the only situation where fuel models are predicted to change.

The alternatives potentially differ in their impacts on vegetation through application of different amounts of wildland fire use. Under the No Action Alternative, wildland fire use is restricted to 2,000 acres in the center of the park. Alternative A allows wildland fire use across the entire monument except for a 300- acre developed corridor at the west end (11,685 total acres of wildland fire use). Risk of catastrophic wildfire is reduced relative to the No Action Alternative due to the larger area under wildland fire use. Alternative B allows wildland fire use in all areas (except the corridor) and in the ZOC on Coronado National Forest lands on the north, east, and south sides of the park. Catastrophic fire risk is lowest under Alternative B, with 16,985 acres under wildland fire use.

Effects of fire on the vegetation communities at Chiricahua are moderated by the scale of fire program activities and fire behavior. The prescribed burn units proposed for this program range in size from 30 to 1,000 acres, with 10% of the park (1,200 acres) the guideline for maximum area treated at any one time. Vegetation within a given unit is expected to burn with differing intensities and to produce a mosaic of unburned, lightly burned, and moderately burned vegetation. Minimal high- intensity burning is expected.

Wildland fire use is expected to have similar effects on vegetation as prescribed fire, since goals and prescriptions will be very similar for both. Wildland fire use may be permitted over larger areas (than burn units at the same sites) when conditions are such that widespread benefit can be expected. The present analysis has predicted a single wildland fire use event over the tenure of the plan; however, the actual number of starts cannot be predicted. Potential acreage under wildland fire use is limited by the maximum manageable area (a predefined perimeter) and daily situation analysis. Because effects of wildland fire use and prescribed fire should be similar, they are combined for the analysis of vegetation types.

The impact analysis takes into consideration effects by vegetation type and by spatial/temporal relationships.

Vegetation Type Effects

Chapter III describes the existing condition of four vegetation types that are the basis for fire management at Chiricahua and are also addressed in this analysis. Appendix III reviews the effects of fire on dominant plant species in each of the four types. The potential community- level effects of both prescribed fire and wildland fire use are generally described below.

- In Pine with Mixed Conifers and Hardwoods (P), fire generally thins conifers, with larger trees surviving, and topkills hardwoods that later resprout. Other expected effects of burning include:
    - Vegetation type staying in condition class 2, moving toward condition class 1
    - Possible change from fuel model 10 (forest with heavy dead- down materials and live understory) to 9 (forest with moderate litter, concentrations of dead- down, patchy understory) in areas currently model 10
    - Reduction of litter, dead/down material
    - Reduction of ladder fuels
    - Moving toward condition class 1 or the historic fire regime (historic frequency/duration of burns, seasonality, intensity, event size, mosaic of burned and unburned patches) with repeated fire

- In Mixed Oaks (O), fire thins standing oak stems without killing trees, and plants later resprout. Conifers are thinned and cover of resprouting shrub understory is temporarily decreased. Manzanita reseeds. Other expected effects of burning include:
    - Vegetation type staying in condition class 2, moving toward 1
    - Possible change from fuel model 10 to 8 (forest with light litter and little understory) in areas currently model 10
    - Short- term shrub cover decrease
    - Increase in manzanita seedlings
    - Increase in native muhly grasses
    - Vigorous resprouting of oaks (especially silverleaf)
    - Moving toward condition class 1 or the historic fire regime (historic frequency/duration of burns, seasonality, intensity, event size, mosaic of burned and unburned patches) with repeated fire

- In the Manzanita Shrub Community (M), pointleaf manzanita reseeds prolifically following fire, and cover builds up over decades. Other expected effects of burning include
    - Possible change from fuel model 6 (older flammable shrubs with moderate dead material, litter, and grass) to 5 (younger stands with less material to carry fire) or 2 (grassier) in areas currently model 6
    - Moving toward to condition class 1 or the historic fire regime (historic frequency/duration of burns, seasonality, intensity, event size, mosaic of burned and unburned patches) with repeated fire
    - Two condition class responses
        - 2 to 1 (expected with high- intensity burns): reducing shrub cover, increasing native grasses and forbs OR type conversion to grass

        - 2 to 2 (expected with low/moderate- intensity burns or in areas only supporting shrubs): minor reduction in shrubs and minor increase in grasses and forbs

- In Mixed Grasses with Minor Shrub/Tree Component (G), grasses generally respond favorably to fire. Post- fire densities of non- native Lehmann lovegrass may be higher than pre- fire. Most shrubs rapidly resprout. Other expected effects of burning include
    - Moving toward condition class 1 or the historic fire regime (historic frequency/duration of burns, seasonality, intensity, event size, mosaic of burned and unburned patches) with repeated fire
    - Three condition class responses:
        - 2 to 1: Maintain composition of native grasslands as native
        - 2 to 2: Mostly natives before burn and < 50% Lehmann lovegrass after or 2 to 2: Lehmann lovegrass present before burn and increase in Lehmann lovegrass after burn
        - 2 to 3: Mostly native grasses before burn to >50% Lehmann lovegrass after burn

Spatial/Temporal Effects

The same series of prescribed fires is proposed under all alternatives (see Figure II- 1 and Table II- 3), with burn units on the east and south boundaries extending onto the Coronado National Forest under Alternative B. The effects to vegetation in the burn units follow the general patterns previously described for each vegetation type, as noted in Table II- 3. The burns over the tenure of the new fire management plan are expected to produce gradual change in the composition and structure of vegetation communities over time. Most burns will be low intensity and produce a mosaic of burned and unburned areas, in part due to the rockiness of the monument. Changes in condition class may not be accomplished during the planning period, as repeated treatments may be required. Acres per treatment through 2012 ranges from 30 to 1,000 and are less than 10% of the monument for any given project. Maximum acres per year are 1,300, just over 10% of the 11,985- acre monument. The schedule is dynamic and will likely vary as prescriptions and availability of resources change. Below is a year- by- year prediction of effects in specific burn units. Vegetation type abbreviations are explained above.

Sensitive Plant Species

Chapter III introduced the sensitive species on the monument that require consideration during the fire planning process. NPS consulted with U.S. Fish and Wildlife Service, USFS, and the Arizona Department of Game and Fish to create the list of species, and Table III- 5 summarizes their status. Fire- related considerations for each of the sensitive plant species identified in Chapter III appear in Appendix II. Some of these species are protected from fire by rocky habitats, and others live where fire benefits their habitat. They may suffer short- term minor adverse effects but experience

long- term beneficial effects from fire program activities. In all cases, plants will be noted in pre- project reconnaissance and post- fire monitoring plots.

Impacts of the fire program on vegetation have been developed from research and monitoring results within the monument, the literature, vegetation mapping from 1939 to the present, interdisciplinary team meetings, and the experiences of staff and outside experts. The fire history of the monument has been well studied by the University of Arizona Laboratory of Tree Ring Research. Work with U.S. Fish and Wildlife Service on the Biological Assessment produced conclusions about threatened and endangered species. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: Changes in vegetative communities would not be measurable, with no effect on native species populations. Any effects would be small scale, and no species of special concern would be affected.

Minor: Changes in vegetative communities or species populations would be measurable, with small and localized effects to a relatively minor portion of any species population. Species diversity would not be changed.

Moderate: Changes in vegetative communities or species populations would be readily apparent, with effects to a sizeable segment of the species' population over a relatively large area. Species diversity would be changed, but not considered a threat to the long- term survivability of the species in question.

Major: An action that could decrease the species diversity of the monument, be considered a threat to the long- term survivability of populations in question and/or eliminate the population of a species that is locally endemic or considered key to the natural integrity of the monument; or an action that would increase species diversity or population numbers of particular species.

Impairment: A major, adverse impact to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents.

Short- term: A return to the pre- event range of variability in distribution and abundance of species within the natural fire interval of the affected habitat.

Long- term: Unlikely to return to pre- event range of variability in distribution and abundance of species within the natural fire interval of the affected habitat.

Impacts of No Action Alternative

Impact Analysis
The No Action Alternative would continue fire exclusion and suppression of ignitions in most of the monument, with a small fire use area and limited prescribed burning. Fuel loading within the monument and along the boundaries would continue to increase. There would be a continued lack of more frequent, less intense wildland fires; and over time, an increase in severe wildland fires would be likely.

The vegetation communities would experience varying impacts and reactions to this unnatural fire regime. For example, manzanita has encroached on native grasslands due to the influence of over 100 years of suppression in the Chiricahua Mountains, as well as the introduction of cattle. This has altered the natural cycle of periodic fires. Concurrently, the buildup of fuels in the oak/pine forests decreases the chance of pine tree survival in extreme fires and creates ladder fuels that can allow development of more severe crown fires. In the long- term, there would be a shift from pine forest to oak forest, due to the differing survival mechanisms of pines and oaks to high intensity wildland fires and the loss of grassland communities from manzanita encroachment. Fire suppression would cause a moderate, indirect long- term adverse impact on plant communities as well as individual plants. Adverse effects would be mitigated by using Minimum Impact Suppression Tactics in all suppression actions, limiting the use of retardant, use of resource advisors, and utilizing the best management strategy for fire suppression.

Goals and objectives for prescribed burns and wildland fire use include parameters designed to move the vegetation condition class from a Class II (moderately displaced from the natural fire regime) to a Class I (within the natural fire regime) for all vegetation communities. It is unlikely that this transition would occur during the tenure of this FMP. The small fire use FMU (2,000 acres) is too restrictive to allow fire to play its natural role; fuels would continue to build in this area and eventually become susceptible to high intensity wildland fires that would have the potential to cause moderate, short- term and long- term, direct and indirect adverse impacts on plant communities and individuals. The existing prescribed fire areas are also small and isolated, and would not allow for sufficient change in plant communities to reduce the risk of high intensity wildland fires occurring in these areas. Mitigation measures for prescribed burning include adhering to appropriate objectives and prescriptions to enhance plant communities and individuals within prescribed burn units, implementing prescribed burns when low to moderate intensity fires can be predicted, and utilizing a fuels treatment rotation that would provide for multiple treatments of a particular burn unit.

Cumulative Effects
Activities considered in the cumulative effects analysis include road resurfacing and utilities replacement projects; ongoing suppression policy resulting in increased fuel loadings; past and future prescribed burns; large, high severity fires in the Chiricahua Mountains that reach the monument; grazing on the Coronado National Forest ZOC causing non- attainment of goals and objectives on prescribed fires and wildland fire use fires; ongoing drought and insect outbreaks; and future development of ranchlands outside the monument causing potential increase in non- native plant species to establish. These activities combined with the No Action Alternative would cumulatively result in moderate to major, long- term detrimental effects.

Conclusion
Overall, the No Action Alternative would result in moderate, short- term, direct adverse impacts on individual plants from high- severity fires in or near the monument boundaries as a result of the fire regime moving from low intensity to moderate/high intensity fires. This alternative would also result in moderate, long- term, direct adverse impacts on plant communities due to continued suppression of wildland fires as well as insufficient treatment of fuels through prescribed burning and fire use. However, the reintroduction of fire into a fire- adapted ecosystem would result in moderate, long-term beneficial effects to plant communities and individual plants.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
The strategies of wildland fire use for resource benefit, manual/mechanical treatment, and prescribed fire application would result in minor loss of individual plants through normal mortality. Disturbance from the action of work crews, slash pile burning, removal of individual trees, and thinning/limbing would result in localized, direct, negligible to minor effects to plant communities. Adverse effects would be mitigated by appropriate planning of line location and pile locations, as well as briefing of crews for resource sensitization. However, thinning through mechanical methods or by prescribed burning is desirable to promote reduction of overstocked understory trees and shrubs, implement a type conversion from shrublands to the historic grasslands, and to reintroduce fire into fire- adapted ecosystems.

Long- term threat of high intensity wildland fires would subside with monument- wide application of prescribed fire and wildland fire use. Prescribed burn units ranging in size from 30 to 1,000 acres would allow for fire to play its natural role in these ecosystems. Sensitive species would benefit as management objectives are met. Prescribed burning as well as slash pile burning would result in some beneficial effects as nutrients are released into the soil. The impacts to vegetation from wildland fire use are expected to be similar to those associated with prescribed fire, i.e. individual plant mortality, species structure and composition change, and reduction in fuel loading.

Wildland fire use may result in fire events of greater duration and extent than prescribed fire. With the wildland fire use FMU encompassing all but 300 acres of the monument, required suppression actions on fires would be less frequent, and would result in minor to moderate short- term, direct adverse impacts on plant communities and individuals as more fire use fires are allowed to burn. Continued suppression of fires within the 300- acre corridor would cause minor to moderate, short- term, direct adverse impacts to individual plants in direct relation to fire intensity and suppression activities. Mitigation measures would include appropriate planning of line location, briefing of crews for resource sensitization, detecting and locating threatened and endangered species so habitat can be avoided, using minimum impact suppression tactics, and using appropriate management strategy in fire suppression.

Most native plant associations are adapted to the effects of periodic surface fires, and prescribed fire and wildland fire use fires would produce moderate, long- term beneficial effects in these communities. The ponderosa pine forests of the southwest have been studied extensively (Potter and Foxx 1984, Wright and Bailey 1982, Grissino-Mayer and Swetnam 1983). Prescribed fire typically benefits ponderosa pine and closely- related pine species through reduction in stem density, temporary reduction of understory shrubs (releasing nutrients for the pines), and reduction of ground and ladder fuels (protecting trees from more severe fires). In the pine/oak community, fire generally thins conifers, with larger trees surviving, and topkills hardwoods that later sprout. Areas that are currently in Condition Class II will be treated to move toward Condition Class I, with reduction of litter, dead/down material, and ladder fuels.

In the oak community, fire thins standing oak stems without killing the trees, and plants later resprout. Conifers are thinned and cover of the resprouting shrub understory is temporarily decreased. Manzanita will reseed. Areas that are currently in Condition Class II will be treated to move toward Condition Class I, with short- term decrease in shrub cover, increase in manzanita seedlings and native grasses, and vigorous resprouting of oaks.

In the manzanita community, pointleaf manzanita reseeds prolifically following fire, and cover increases over time. Areas with sufficient cover of shrubs and grasses will be treated to move from Condition Class II to I over time. Areas with little continuous

cover will not be treated with prescribed fire, but will be allowed to burn when ignited. These areas will probably remain a Condition Class II.

In the mixed grass community, grasses generally respond favorably to fire, and most shrubs rapidly resprout. Areas with native grasses will move from Condition Class II to I with generally one prescribed fire treatment. Areas prone to Lehmann lovegrass invasion will remain in Condition Class II after burning. Areas with established Lehmann lovegrass will most likely move from Condition Class II to III after treatment.

Short- term direct adverse impacts (two to three years post- burn) to vegetation in the planning area would result from Alternative A, but the creation of vegetative mosaic patterns favoring an open overstory and a perennial herbaceous- native forb understory would create a beneficial effect. Over time (three years post- burn and beyond), more pronounced increases in species richness, diversity, and resiliency would occur, with a tendency toward fire- tolerant plant species across the affected landscape. Under Alternative A, re- entries with prescribed fire and implementation of wildland fire use would continue to encourage a structural mosaic of diverse plant associations. Weedy plants tend to be poor competitors and would be gradually replaced by long- lived perennial plants, especially as nutrients increase through cycling. Fire regimes would remain in a more natural low intensity category within the monument boundary.

Cumulative Effects
The cumulative effects to vegetation are similar to the No Action Alternative, but would include a larger fire use and prescribed fire area. In addition, adverse impacts would be reduced to minor to moderate, because fewer fires would need to be suppressed.

Conclusion
Under Alternative A, the short- term, direct, adverse impacts to vegetation would be minor to moderate and localized, but there would be long- term, moderate, beneficial impacts to vegetation in the planning area through re- introduction of fire into the system, which would decrease fuel loading, ladder fuels, stand density, and the potential for more severe wildfires.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative B (Watershed Plan)

Impact Analysis

The impacts of Alternative B would be similar to Alternative A, except that Alternative B includes an additional 5,300 acres of US Forest Service land, in the ZOC. Prescribed fires and wildland fire use fires would be larger and would cause moderate to major, long- term beneficial effects to vegetation communities. Effects of suppression actions would be minimized due to use of natural barriers both for prescribed burns and for wildland fire use fires. Fuels would be reduced on a larger area, and would therefore reduce the adverse effects of a wildland fire burning in the monument.

Cumulative Effects
Cumulative effects are similar to Alternative A.

Conclusion
The effects of Alternative B would be similar to Alternative A, except more extensive in area. Fire management actions within the ZOC would further lessen the potential adverse effects of future wildland fire events, particularly those originating from outside the monument.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments of Resources
Some plant mortality would result from fuel treatment activities. If soils become sterile and/or hydrophobic due to high severity fire, vegetation reestablishment may be inhibited. Under all alternative fire management scenarios, fuels reduction activities would be implemented to reduce the potential for high severity fire, with the greatest fuel reduction occurring under Alternative B.

Loss in Long- Term Availability Or Productivity Of the Resource to Achieve Short- Term Gain
In the short- term, vegetation would be affected by fuel treatment activities; more with Alternative B, to a lesser extent with Alternative A, and the least with the No Action Alternative. The long- term benefit of such activities is the reduced risk of catastrophic fire, which could have a profound effect on the composition and structure of vegetative communities.

Where fire must be contained within artificial boundaries such as in the No Action Alternative and Alternative A, vegetation would also be negatively affected in the short-term by more aggressive suppression of unplanned fires. In addition to more limited opportunities for fuel reduction along these boundaries, habitat fragmentation could also occur in the long- term.

Unavoidable Adverse Impacts
All alternatives have the potential to impact vegetation adversely, particularly if exotics become established post- fire. Exotic species can affect the species composition of an area and, in turn, change the fire characteristics of the site, such as burn temperatures and frequency. Mitigation measures would be implemented to reduce the risk of exotics establishment.

Impact Topic 5 (Wildlife)

Background and Methodology
Fire would kill and injure some wildlife in the short- term and benefit many species in the long- term.

Fire effects data have not been collected for animal species at Chiricahua. It is known from the scientific literature that fires can potentially injure or kill animals, and large, intense fires are certainly dangerous to animals caught in their path (Bendell 1974; Singer and Schullery 1989). However, direct mortality from fire is generally considered to be minor (Ganey, Block, and Boucher 1996), with season of burn having a significant impact on mortality (Kruse and Piehl 1986; Lehman and Allendorf 1989; Robbins and Myers 1992). For example, burning during nesting season appears to be most detrimental to bird and small mammal populations (Erwin and Stasiak 1979).

Habitat effects can have more bearing on wildlife than direct mortality (Singer et al. 1989; Vales and Peek 1996). Fires influence animal species indirectly due to habitat modification, changes in food supply, or changes in abundance of competitors and/or predators (Rotenberry et al. 1995; Finch et al. 1997). A review by Finch et al. (1997) points out that reproductive success may be reduced in the first postfire year because of food reductions from spring fires. Thus, changes in vegetative structure and compositions have interlinking effects on the related faunal species.

Fires can impact birds positively or negatively, depending on the season, patchiness, and severity of burning and the particular behavior strategy of the species involved (Kruse and Piehl 1986; Lehman and Allendorf 1989; Robbins and Myers 1992). However, direct mortality due to fire is considered minor for most bird species. Numerous studies have determined that burning during nesting season appears to be most detrimental to ground- nesting populations (Grange 1948; Erwin and Stasiak 1979; Kruse and Peihl 1986; Svedarsky et al. 1986). Nesting success was attributed in part to areas skipped by fire as it burns in a mosaic pattern (Kruse and Piehl 1986). Patchy burns also favor species that require perches and cover above the ground (Bock and Bock 1990). In forested areas, fire effects on birds depend largely on fire severity. Species nesting in the canopy could be injured by intense surface fire and crown fire. At Chiricahua this kind of fire behavior might be expected just before the onset of the monsoon season around the first of July.

Fires favor raptors by reducing cover and exposing prey. Dodd (1988) noted that the Northern harrier, American kestrel, red- tailed hawk, Cooper's hawk, and turkey and black vultures are attracted to fire and recent burns. Raptors are also favored when prey species increase in response to postfire increases in forage. Dodd (1988) describes beneficial effects from fire on populations of burrowing owl in desert grassland, sharp-shinned and Cooper's hawk in chaparral, and northern goshawk and sharp- shinned hawk in ponderosa pine forest.

Smith et al. (2001) studied the effects of prescribed fire on montane rattlesnakes during and after fire in the Peloncillo Mountains, just east of the Chiricahuas on the Arizona-New Mexico state line. All nine individual snakes studied sought refuge from fire; one died. Simons (1989) reported similar mortality in general for reptiles in southern Arizona.

Overall, mobility of wildlife helps prevent direct mortality as a result of fire program activities. Prescribed burns leave mosaics of burned and unburned patches on the landscape, and the largest prescribed burn proposed under a new fire management plan covers 1,000 acres, 8% of the park. Prescriptions restrict wildland fire use and prescribed burns to environmental conditions that avoid widespread, high- severity, habitat- damaging events. Fires that move vegetation towards natural composition, cover, and density benefit native wildlife.

Sensitive Species. Chapter III introduced the sensitive species on the monument that require consideration during the fire planning process. NPS consulted with U.S. Fish and Wildlife Service, USFS, and the Arizona Department of Game and Fish to create the list of species, and Table III- 5 summarizes their status. Appendix II contains a discussion of fire- related considerations for each of the sensitive species identified in Chapter III. Conclusions for lesser long- nosed bat and Mexican spotted owl, the species primarily addressed in the Biological Assessment, are repeated below:

Leptonycteris curasoae yerbabuenae
Lesser long- nosed bat
Fire is not likely to directly affect any bats that may occur in the monument due to their mobility and active prevention of fire at cave and mine sites that may serve as roosts. Fire can indirectly affect the bats by destroying Palmer's agave, an important regional food source. Where hot- burning, non- native Lehmann lovegrass is the dominant grass surrounding them, fire puts agaves at higher risk for destruction. Less intense fires, such as would occur in a grassland comprised of native species, would not necessarily consume the plant. The monument has committed to the U.S. Fish and Wildlife Service to keep agave mortality from prescribed fire at less than 20% of the plants in any given location; monitoring results from two prescribed burns in the monument showed apparent mortality immediately post- burn at 11.3% in one area and 6.1% in the other, with actual mortality decreasing with time (Dennett et al. 2000). Two prescribed burns

are scheduled for grassland areas that are the primary habitat for Palmer's agave: South Slope (2008) and North Slope (2008).

Strix occidentalis lucida
Mexican spotted owl
Fire is not likely to directly affect Mexican spotted owls due to their mobility. Smoke, heat, loss of owl prey species (due to loss of prey species habitat), and noise could have indirect effects. Smoke would be managed according to Arizona Department of Environmental Quality's permit requirements. Fire operations must proceed without helicopter flight over PACs during the nesting season (March through August). By conducting low- intensity prescribed fire, and managing natural ignitions to meet low-intensity objectives, (including meeting appropriate fire prescriptions), the monument would minimize heat effects to known owls. Resource advisors with knowledge of Mexican spotted owls must be onsite during burning operations and would participate in decisions relating to escaped prescribed fire and suppression actions. Loss of prey species would likely occur in burned areas for the first growing season, post- burn. Post- monsoon rains would allow grasses and forbs to grow, with small mammals fully expected to return to pre- burn numbers. Canopy closure in the habitat is expected to remain the same percent after burning. Though factors that constitute disturbances to these owls will be minimized, the introduction of fire in the vicinity of the monument owl PACs is planned. Three prescribed burns are scheduled to reduce fuels in PACs such that wildland fire use is safe: Echo Park (2007), Shake Spring (2008), and another Echo Park entry (2011).

Accipiter gentilis
Northern Goshawk
Northern Goshawks (state and USFS sensitive) have been seen in Echo Park, in the vicinity of the Organ Pipe formation, lower Totem Canyon, and by the Headquarters building. They have been known to nest in Echo Park and the Headquarters building, and in 1977, 1979, and 1999 have fledged young. Fires and suppression activities would not adversely affect the goshawk, since they can easily vacate the affected areas and use nearby areas for feeding, perching, and resting.

The area of analysis for this topic includes the monument lands and the surrounding Coronado National Forest. Available information was obtained through interdisciplinary team meetings, research and monitoring results within the monument, the literature, consultation with the US Fish and Wildlife Service, and the experience of staff and outside subject matter experts. The fire history of the monument has been well studied by the University of Arizona Laboratory of Tree Ring Research. Work with U.S. Fish and Wildlife Service on the Biological Assessment produced conclusions about threatened and endangered species. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: There would be no observable or measurable impacts on federally listed species, non- listed wildlife species or their individuals, their habitats, or natural processes sustaining them. Impacts would be well within the range of natural fluctuations.

Minor: Impacts on federally- listed species or other wildlife would be detectable, but would not be expected to be outside the natural range of variability and would not be expected to have any long- term effects on native species, their habitats, or the natural processes sustaining them. Species viability and genetic variability would remain stable over the long- term. Occasional responses to disturbance by some individuals would not interfere with feeding, reproduction, or population dynamics. Ecosystem process and species habitat could have minor disruptions, but no long- term impacts that would be considered outside natural variations.

Moderate: Impacts on federally- listed species or wildlife would be detectable and could be expected to be outside the natural range of variability and to have long- term effects on native species, their habitats, or the natural processes sustaining them. However, species viability and genetic variability would remain stable over the long- term. Frequent responses to disturbance by some individuals could be expected, with some interference with feeding, reproduction, or population dynamics. Ecosystem process and species habitat could have minor disruptions but no long- term impacts that would be considered outside natural variations. Breeding animals of concern are considered present. Mortality or interference with activities necessary for survival can be expected on an occasional basis without threatening the continued existence of the species in the park.

Major: Impacts on federally- listed species or wildlife would be detectable, and would be expected to be outside the natural range of variability and have long- term effects on native species, their habitats, or the natural processes sustaining them. Species viability and genetic variability could have long-term impacts affecting population dynamics. Frequent responses to disturbance by some individuals would be expected, with adverse impacts on feeding, reproduction, or decreases in population levels. Ecosystem process and species habitat could be lost over the long- term and would be considered outside natural variations. Breeding animals of concern might relocate to other areas of the park. Mortality or interference with activities necessary for survival is expected.

Impairment: A major, adverse impact to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the

monument's general management plan or other relevant National Park Service planning documents.

Short- term: Recovers in less than one to three years after fire or other action (depending on the species).

Long- term: Takes more than one to three years after fire or other action (depending on the species).

Impacts of No Action Alternative

Impact Analysis
The No Action Alternative would continue the practice of full suppression of wildland fires in all but the wildland fire use FMU, with a limited fuels management program in isolated areas of the monument. Wildland fire use fires would be allowed, on a case- by-case basis, within the wildland fire use FMU. In the short- term, lands would continue to experience impacts such as the spread of non- native plant species; reduction in fire-dependent species; and an increase in tree densities, surface fuels, and ladder fuels which may facilitate crown fire conditions. Based on continuance of these conditions, disturbance to habitat for many species is likely, resulting in short- term to long- term, minor to moderate adverse impacts to wildlife mainly from habitat disturbance and, to a lesser degree, direct mortality of individuals. Adverse short- term impacts from fire and suppression activities would range from minor to moderate for the species present, depending on the season, intensity and location of the fire and the ensuing suppression activities. Possible localized loss of less mobile individuals, such as nesting birds, small mammals, and lizards, could occur, especially during the breeding season. Other species, such as bear, deer, mountain lion, coati, skunks, and squirrels, would escape most fires and move to unburned areas.

Long- term impacts would include the continued shift to fire- intolerant vegetation that ultimately would change the structure and composition of vegetative communities and habitats, change the availability of the food supply, or change the abundance of competitors and/or predators of a species. This would result in minor to moderate adverse impacts on the diversity of wildlife that previously relied on the availability of native plants and their structure and function. Additionally, as open- canopy habitats become unnaturally closed in the absence of natural disturbance fire events, the diversity of wildlife that use those habitats would decrease, although species that require larger, mature trees would benefit in the short- term.

Cumulative Effects
The cumulative effect analysis considers the effects of the No Action Alternative, added to the effects of existing and future fire management activities throughout the monument and the Coronado National Forest, minor maintenance projects planned for the monument, visitor use and human presence in the areas, grazing and hunting on the

Coronado National Forest, drought and insect outbreaks, and future development of ranchlands on the west side of the monument. Overall, the cumulative impact would be minor to moderate, direct and indirect, and adverse.

Conclusion
Under the No Action Alternative, current management would result in minor to moderate, adverse impacts to wildlife and wildlife habitat over the short and long- term, as a result of the continued limited role of fire as a natural disturbance process within these fire- adapted systems.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
Under Alternative A, the types of impacts to wildlife would be the same as described under the No Action Alternative for suppression activities. However, due to the larger size of the wildland fire use FMU in Alternative A, adverse impacts would occur over a small area than in the No Action Alternative because fewer wildland fires would be suppressed over the long- term. In addition, fires would be allowed to burn under predetermined prescriptions that would provide for maximum benefit of wildlife and their habitat. Long- term, direct beneficial effects of fire use fires and prescribed burning are expected.

Prescribed fires would be planned for non- breeding periods for most species, and would be less intense and more widespread, thus affecting positively wildlife habitat. Short- term impacts to some wildlife species include negligible to minor disturbances from the presence of humans and equipment during wildland or prescribed fire operations and infrequent, minor disturbance to breeding activity during the early part of the fire season as a result of human presence. Small mammal cover would be exposed over localized areas, which benefits predator species. Within two post- burn growing seasons, particularly during wetter years, sprouting and general re- growth of grasses, forbs, and shrubs would moderately enhance habitat conditions for many species of wildlife. However, those species that are more dependent on dense woodlands and large trees may be adversely affected in the short- term.

Long- term beneficial impacts would include a moderate increase in species diversity and overall species resiliency as treated vegetative communities became further re-

established with healthy young growth. Access to springs or seeps would be improved for wildlife use where thinning occurred and where surface fuels were reduced from fire or a combination of fire and mechanical thinning, as defined under Alternative A.

For the pine/oak ecosystem, the reintroduction of fire into the present- day forest would have the potential to greatly change the frequency and distribution of key wildlife habitat components, such as snags, downed logs, old trees, and large oaks (Quercus spp.). Snags are an important component and need to be present in appropriate densities in forested ecosystems for cavity- nesting birds. Downed logs are important to small mammals, and post- burn colonizing oaks provide habitat for birds, bats, ungulates, and small mammals. In areas where snags are important to retain as wildlife habitat, lining (building fire lines around specific snags or logs) would be used to protect these snags (Randall- Parker and Miller 1999). Also, fire can create new snags that wildlife can use in the future. Therefore, short- and long- term, direct beneficial impacts could result for wildlife in the pine/oak association by the periodic presence of low-intensity fire.

Mitigation measures include adjusting thinning and prescribed fire prescriptions to allow for low- intensity surface fire, ensuring that appropriate treatment areas are arranged to maximize edge effect, and providing for adequate cover and travel corridors, as well as retaining snags and logs described above. Cave fauna may require specific protection measures to mitigate the impacts from wildland and prescribed fire, such as selective thinning and fuels removal in and around cave entrances.
The strategies of wildland fire use and prescribed fire, in combination with mechanical fuel reduction and prudent application of mitigating actions (such as minimizing ground disturbance) would result in long- term beneficial impacts to habitats.

Cumulative Effects
The cumulative effect of Alternative A, combined with other administrative and maintenance actions in the area as listed in the cumulative effects analysis for the No Action Alternative, would result in minor, adverse impacts to wildlife, assuming mitigation is used and wildland fire use occurs in appropriate seasons to minimize impacts on breeding animals and to reduce fire intensity. Regional fires could add to the level of impacts sustained.

Conclusion
Alternative A would generally result in minor, short- term, adverse impacts to wildlife. When the natural role of wildland fire is again restored to these fire- adapted ecosystems, the habitat variety and diversity of plant communities would increase. Wildlife would benefit from increased nutritional quality, availability of forage, and healthier habitat characteristics. This would result in long- term, beneficial impacts to most species.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
Under Alternative B, adverse impacts to all species would be similar to those described for Alternative A, except that an additional 5,300 acres of US Forest Service land in the ZOC is included. Alternative B would decrease the potential for higher intensity wildland fires by implementing wildland fire use and prescribed fire over a larger area. Because of this and the reduced need for unplanned fire line construction, the duration, extent, and intensity of long- term adverse impacts would be reduced. Erosion and resulting sedimentation impacts occurring following severe fire would be reduced, benefitting most species. Most species would also greatly benefit from minimizing fuel buildup levels in riparian areas and Mexican spotted owl PACs and taking care to avoid sensitive species during pre- planned fuel reduction activites.

Cumulative Impacts
Under Alternative B, the cumulative impact analysis would be similar to Alternative A. However, impacts from prescribed burns or thinning would be minimized by spacing out fuels reduction actions and coordinating them with other fire use decisions made by the USFS within the Coronado National Forest, in order to avoid affecting widespread areas at any one time. Cumulative adverse impacts to all listed species would be reduced, and beneficial impacts realized, through the mitigation included in this alternative, especially the avoidance of any nesting and breeding seasons and coordination with USFWS for action involving the Mexican spotted owl and its habitat, and the lesser long- nosed bat and its food source, Palmer's agave. In the long- term, Alternative B would result in a greatly reduced chance of widespread, catastrophic wildfire in the monument and in the ZOC— a long- term beneficial effect.

Conclusion
Alternative B would result in negligible to minor adverse short- and long- term impacts to many listed species, with short- term, minor, direct and indirect adverse impacts to some listed species due to unavoidable effects of fire use, prescribed fire, and thinning. Alternative B could improve effects on the Mexican spotted owl and its habitat due to increased protection from catastrophic wildfire — a long- term, beneficial effect to the species.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the

establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments of Resources
Fires could result in mortality of less mobile wildlife species. Other species could be displaced during a fire event, and due to habitat change, may not return.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain
In the short- term, fuel reduction activities would affect wildlife habitat; the long- term goals of these activities would be the reduction of risk for catastrophic fire. Catastrophic fire would have a detrimental effect on protective cover and nesting areas for certain species. For some species, food sources and foraging areas would be negatively affected. In general, recovery of habitat functions would take more time with a large, catastrophic fire event as opposed to a lower intensity fire, where fuels have been managed. Large, intense fires would thus have a greater effect on wildlife. Alternative B would reduce fuel loadings to an increased degree than Alternative A and No Action, respectively; Alternative B would be the least disruptive to wildlife in the long- term.

Unavoidable Adverse Impacts
Under all alternatives, adverse impacts to wildlife such as mortality, injury, and displacement could occur. Habitat change due to fragmentation or exotics establishment could favor certain species over others. Mitigation measures to avoid or minimize direct adverse impacts to wildlife would be implemented for planned fires and mechanical/manual fuels treatment projects. Exotics control would be implemented to avoid indirect effects of habitat change. Habitat fragmentation could occur where the vegetation along boundaries is managed differently from adjacent areas, as in Alternative A and No Action.

Impact Topic 6 (Unique Sites and Wilderness)

Background and Methodology
Fire may change character of natural sites unique to the park and wilderness.

Certain natural resources at Chiricahua are identified as having unique values that require specific attention in this DEIS. The key attraction— pinnacles—can be charred by fire, but fire would open up views and make individual formations more visible, as historic photographs show they were when the monument was established. Other unique natural features are the Silver Spur meadow in Bonita Canyon, springs, an old growth forest patch in Echo Park, and the relict Arizona cypress monoculture stands in Rhyolite and Bonita Canyons. The old growth patches are potentially irreplaceable or renewable only in the very long- term. The springs and meadow likely require fire to

keep out encroaching vegetation that can dry up flows in the case of the former, and cause type conversion in the case of the latter.

The IDT have treated wilderness as a unique site because it is a special natural feature that the monument deliberately protects, and that people seek out when they visit.

The IDT produced a list of unique sites at the monument. Monument resource management staff made the determination of impacts based on experience with fuels reduction projects around those sites and in wilderness. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: The impact on the unique sites and wilderness is at the lowest levels of detection, barely perceptible and not measurable.

Minor: The impact on unique sites and wilderness is measurable and perceptible, but it is slight and localized. The impact does not affect the character-defining features of the site or jeopardize the site's integrity.

Moderate: The impact is measurable and perceptible. The impact changes one or more character- defining feature(s) of a unique site or wilderness but does not affect the site to the extent that its integrity is jeopardized.

Major: The impact is substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For adverse effects, the impact changes one or more character defining feature(s) to the extent that its integrity is jeopardized and the unique site or wilderness is no longer considered suitable for special recognition.

Impairment: A major, adverse impact to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents.

Short- term: A return of unique sites or wilderness to pre- event states within the natural fire interval of the affected habitat.

Long- term: No return of unique sites or wilderness to pre- event states within the natural fire interval of the affected habitat.

Impacts of No Action Alternative

Impact Analysis
Eighty- seven percent of the monument is designated as official wilderness. Monument staff manage wilderness in accordance with the Wilderness Act and associated National Park Service management policies; projects requiring manipulation of key resources in wilderness areas are minimized to the fullest extent possible. Under the No Action Alternative, much of the designated wilderness is in FMU#2 where all wildland fires are suppressed. Potential direct minor to moderate, short- term, adverse impacts exist due to suppression activities. Although excluded in wilderness areas, ground disturbance, retardant application, and increased noise from suppression/aviation activities in adjacent areas could adversely affect wilderness areas and visitors' enjoyment of these areas. Timing of wildland fire use fires only during the monsoon season minimizes the threat of adverse effects to these unique sites and wilderness. Because of this, low- to moderate- intensity wildland fire use fires would result in direct minor to moderate, short- term, adverse impacts and will subside with each post- fire season because fire is part of the process for natural sites. However, the small size of the wildland fire use FMU would eventually cause a potential moderate to major, long- term, direct adverse impact to wilderness by allowing high intensity wildland fires to occur due to buildup of fuels over time. Minor to moderate, indirect, long- term beneficial effects would occur due to the reintroduction of fire into fire- adapted ecosystems, but would be localized depending on fire intensity, fire frequency, seasonality, duration, and other fire regime factors. Prescribed burning and fire suppression activities may be used to minimize damage to unique sites and wilderness areas.

Mitigation measures include prescribed burning around unique sites to reduce intensity and duration of future wildland fires; fire suppression in and around fire- intolerant sites; timing wildland fire use and prescribed fires to minimize intensity; and conducting minimum tool analysis to protect wilderness values.

Cumulative Effects
Cumulative effects include an increase in woody plants and other fuels that place old growth and relict cypress stands at risk from high- intensity fires. Fuels treatments lessen risk of loss and can increase spring flows. Drought increases the risk of catastrophic fire and will make protecting sensitive sites more difficult. These factors would cumulatively result in minor to moderate, direct, long- term adverse impacts to wilderness and the unique sites of the monument.

Conclusion
The No Action Alternative would have minor to moderate, short- term, direct and indirect, adverse effects due to fuels buildup and the ensuing high- intensity wildland fires. However, the reintroduction of fire would have minor to moderate, long- term beneficial effects on wilderness and unique sites, if reintroduced through wildland fire use and prescribed fire.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
Under Alternative A, wildland fire use fires would be allowed to burn through all of the monument except in the developed corridor. Additionally, low- to moderate- intensity prescribed burns would be implemented in the entirety of the monument. Because of this, minor to moderate short- term, direct adverse impacts would be expected from fire use and prescribed fires, depending on location, frequency, intensity, duration, seasonality, and other fire regime factors. As more wildland fire use fires occur and land is burned more frequently, these adverse impacts would become negligible to minor and short- term in nature. Treatment of fuels through prescribed burning would ultimately decrease intensity of any wildland fires igniting within burn units, and may result in minor to moderate, short- term, direct adverse impacts from the wildland fire. The reintroduction of fire into fire- adapted ecosystems will result in moderate to major, direct, long- term benefit to these unique sites and wilderness by allowing natural processes to take place.

Cumulative Effects
Cumulative effects are similar to the No Action Alternative. However, with the increased use of prescribed burning and wildland fire use fires, the effects of drought on plant species would be reduced by providing less competition for resources (water, nutrients, etc.).

Conclusion
Alternative A would result in minor to moderate, direct, short- term adverse impacts to wilderness and the unique sites of the monument due to suppression actions during wildland fires, and not allowing fire to play its full role by restricting wildland fire use fires to the confines of the monument.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Alternative B (Watershed Plan)

Impact Analysis
Impacts for Alternative B are similar to Alternative A, except that Alternative B includes 5,300 acres of US Forest Service land. Wildland fire use fires would be allowed to burn larger areas of land, thus causing minor to moderate, direct, short- term beneficial effects as well as moderate to major, long- term, beneficial effects on wilderness and the unique sites of the monument by allowing fire to play its natural role. Effects of suppression actions would be minimized due to use of natural barriers both for prescribed burns and for fire use fires. Fuels would be reduced on a larger area, and would therefore reduce adverse impacts of a wildland fire burning in the monument.

Cumulative Effects
Cumulative effects are similar to Alternative A, with increased benefit to wilderness and unique sites due to long- term reduced risk of catastrophic fire.

Conclusion
The effects of Alternative B would be similar to Alternative A, except they would apply to a more extensive area. Fire management actions within the 5,300- acre ZOC would further lessen the potential adverse effects of future wildland fire events, particularly those originating from outside the monument.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments Of Resources
Irreversible or irretrievable commitments of wilderness or unique sites would not occur under any of the alternatives. Arguably, the old growth forest in Echo Park is an exception to this: if lost, this resource would be replaceable only over the very long-term.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain
There would be greater opportunity for fires at Chiricahua National Monument in the management scenario described by Alternative B. The short- term adverse effects of fire would be offset by the long- term benefit of reestablishing this natural ecosystem process in wilderness areas. Additionally, specific unique sites could be protected more efficiently by strategic fuels reduction projects. The No Action Alternative and Alternative A would be less effective in resource protection and in the reestablishment of the natural role of fire at the park.

Unavoidable Adverse Impacts
Adverse impacts to vegetation, cultural resources, soils, wildlife, air quality, and recreation could occur from fire management activities. These effects are described in the "Unavoidable Adverse Impacts" sections following each impact topic. Mitigation measures would be implemented to avoid and minimize adverse effects from suppression, mechanical treatment, and prescribed fire activities. For wilderness areas, a minimum requirement analysis would be completed prior to conducting fire management activities. The minimum requirement analysis is a decision process for determining if a project or activity is the minimum necessary for administration of the area. It also considers which tools would have the least impact to the wilderness resource.

Impact Topic 7 (Erosion/Debris Flow)

Background and Methodology
Fire can remove vegetation from slopes and cause increased erosion until plants regrow.

Severe wildland fires can consume most vegetation and litter over large areas, resulting in accelerated erosion and surface runoff. Water yield and storm flows generally increase in response to burns. However the amount of increase depends on the relative severity and timing of fires and the proportion of a watershed affected. Prescribed burning under specified conditions will reduce the impacts to soils and watersheds while accomplishing management goals and objectives. A review by Baker (1990) suggests that prescribed burns usually have minimal impact on watersheds as a result of the lower intensity fire and partial maintenance of surface vegetation and litter.

The ultimate goal of treating over 5,000 acres of the various vegetation types to better reflect their inherent fire- adapted communities over the next ten years would promote greater soil water retention and subsequent release to streams and springs. This would reflect the greater influence of native grasses and forbs relative to trees and manzanita and their associated litter. The influence of accelerated erosion would also be reduced or eliminated in the treated areas. This is due to the longer- term direct ground cover protection provided by the desired grasses, forbs and shrubs and their organic matter contribution to soil aggregate stability.

Assessment of erosion and debris flow impacts is supported by staff observations, soils studies (Denny and Peacock 2000) and flood hazard (NPS 2000) studies for the monument. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: An action that would cause no perceptible change to existing rates of erosion, levels of seasonal floodwaters, or sediment load during floods. Effects to soil productivity, fertility, stability, or infiltration capacity would

be below the level of detection. Any effects to soil productivity or fertility would be slight and no long- term effects to soils would occur.

Minor: A slight, but measurable and perceptible change to existing rates of erosion, levels of seasonal floodwaters or sediment load during floods that may necessitate minor rehabilitation, cleanup or repair would occur. The effects to soil productivity, fertility, stability, or infiltration capacity would be detectable, but generally of limited area and localized. Effects to soils productivity or fertility would be small.

Moderate: A measurable and perceptible change to existing rates of erosion, levels of seasonal floodwaters, or sediment load during floods that would necessitate major rehabilitation, cleanup, or repair and road or campground closures would occur. The effects of soil productivity, fertility, stability, or infiltration capacity would be readily apparent and result in a change to the soil character over a relatively wide area.

Major: A highly measurable and perceptible change to existing rates of erosion, levels of seasonal floodwaters, or sediment load during floods that would necessitate major rehabilitation, cleanup, or repair would occur. The effects on soil productivity, fertility, stability, or infiltration capacity would have a substantial and possibly permanent consequence. Effects on productivity or fertility would be readily apparent, long- term, and substantially change the character of the soils over a large area.

Impairment:A major, adverse impact to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents.

Short- term: A return of erosion and debris flows to pre- event rates with 3- 5 summer rainy seasons.

Long- term: No return of erosion and debris flows to pre- event rates with 3- 5 summer rainy seasons.

Impacts of No Action Alternative

Impact Analysis
Under the No Action Alternative, most wildland fires would be suppressed, prescribed fire would continue over a limited area, and a small fire use area would continue to exist. Although it is not anticipated that soils productivity and overall stability would be

adversely affected in the short- term, there would be long- term adverse impacts to soils from the increased risk of high intensity wildland fires. Severe wildland fires can consume most vegetation and litter over large areas, resulting in accelerated erosion and surface runoff. Due to limited prescribed burning and fire use, fuel loading would increase, causing high intensity fires over time and result in minor to moderate, long-term, adverse impacts to soils in the monument. High intensity fires can also create hydrophobic soils, alter soil structure, eliminate organic cover, decrease soil nutrients, increase pH, and kill soil microorganisms. These direct impacts of wildland fire are generally short- term and localized, but accelerated erosion and sedimentation may impact the area over the long- term.

Suppression- related activities, including the use of fire apparatus, fireline construction, and retardant use, would have direct, short- term adverse effects on soils due to soil compaction and disruption, hydraulic mining, and soil coating, resulting in some decrease in productivity and infiltration. To assure recovery of soils, mitigation and rehabilitation actions following firefighting activities will occur to reduce impacts to minor levels.

Cumulative Effects
Activities influencing erosion and debris flows include fire suppression activities in the monument; soil disturbance from other projects, such as trail improvement projects and small construction activities; ongoing increase in cover and density of woody species that increases the likelihood of high intensity fire events resulting in moderate long-term, adverse impacts to soil stability; grazing on USFS lands having adverse impacts on soil productivity and stability; and past and future floods that would have adverse effects on erosion and debris flows. The overall cumulative effect would be long- term, moderate, and adverse.

Conclusion
Fire management related impacts resulting in erosion, floods and debris flows would be adverse, short- term and moderate in intensity, due to the implementation of appropriate mitigation measures. The potential for substantial, adverse impacts resulting from accelerated erosion and debris flows accrues as suppression continues, fuels accumulate, and the likelihood of high intensity, larger fires increases. This scenario is most pronounced in relation to this alternative due to the limited availability of wildland fire use as a management tool.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
Under Alternative A, prescribed fire would be allowed in the entirety of the monument, and wildland fire use would be allowed in all but 300 acres. Suppression activities would occur in the 300 acre developed corridor and as deemed necessary in other parts of the monument. Similar types of adverse effects to soils from wildland fires and wildland fire use would occur, but the effects would be lessened due to the implementation of more wildland fire use over a larger area as well as prescribed fire over the entirety of the monument. Water yield and storm flows generally increase in response to fire use and prescribed fire application, and the amount of increase of water yield and storm flows from wildland fires depend on the relative severity and timing of fires and the proportion of a watershed affected. While soils may experience localized, minor to moderate, short- term, minor adverse impacts in terms of disturbance from the presence of staff, vehicles, and slash removal, prescribed burning under specified conditions will ultimately reduce the impacts to soils and watersheds while accomplishing management goals and objectives. A review by Baker (1990) suggests that prescribed burns usually have minimal impact on watersheds as a result of the lower intensity fire and partial maintenance of surface vegetation and litter. Prescribed fire can also lead to increases in nutrient charge to soils from the creation of ash, which may provide favorable conditions for plant species, nitrogen- fixing microbes, and nitrifying bacteria.

One goal of treating the various vegetation types to better reflect their inherent fire dependent communities over the next ten years is to promote greater soil water retention and subsequent release to streams and springs. This would result in short-term, moderate, direct, beneficial effects to vegetative communities by encouraging the establishment of native grasses and forbs relative to trees and manzanita and their associated litter. Accelerated erosion would also be reduced or eliminated in the treated areas due to the longer- term direct ground cover protection provided by the desired grasses, forbs and shrubs and their organic matter contribution to soil aggregate stability.

Prescribed fire may alleviate the potential for major erosion and debris flow events by reducing fuels conducive to larger severe wildfires. All burn units may experience some short- term erosion. Debris flows are not expected to result from prescribed fires. Mass wasting such as debris flows are inherent to the landscapes at the monument and will occur as a natural event irrespective of park management. Long- term impacts to soils would be largely beneficial from both prescribed fire and fire use fire, due to the reduction of high intensity wildland fires and the expected increase in soil productivity and resultant plant diversity.

Cumulative Effects

The cumulative impact analysis for Alternative A includes those activities listed in the No Action Alternative. The cumulative effect would be adverse, but to a lesser degree than the No Action Alternative, due to reduced need for large suppression activities and treatment of larger areas of the monument with prescribed fire and wildland fire use.

Conclusion
Fire management activities associated with this alternative would result in minor to moderate, short- term adverse effects. However, over the long- term soil stability becomes less threatened as the potential for broader scale high intensity fires is reduced. The opportunity to apply wild land fire use to achieve resource management objectives over a larger land area, in addition to the scheduled prescribed treatments, would likely result in expanded areas of more desired vegetative and ground cover conditions. This would further reduce the amount and continuity of fuels throughout the monument and therefore reduce erosion of mineral soil potentially exposed by more severe fires.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
Activities for Alternative B are the same as for Alternative A, except that Alternative B includes 5,300 acres of USFS land in the ZOC. Prescribed fires and wildland fire use fires would be larger and produce minor to moderate, short- term, direct, adverse impacts to soils. However, treating fuels over a larger area would result in moderate, long- term, direct, beneficial effects to soils because fires would ultimately be less intense.

Cumulative Effects
Cumulative impacts from erosion and debris flows would be the similar to Alternative A.

Conclusion
The effects of Alternative B would be the similar to Alternative A, except that the effects would cover a larger aerial extent. Fire management actions within the ZOC would likely lessen the effects of future high intensity wildland fire events originating from outside the monument. In managing the ZOC, this alternative would create the opportunity to more comprehensively move the park's watersheds toward the desired range of vegetative and ground cover conditions.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the

establishing legislation or proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments of Resources
There would be no irreversible/irretrievable commitments of resources; although, following an intense fire event, it may take a long time and require extensive mitigation for the area to recover.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain
High severity fires can produce vegetation and soil conditions conducive to post- fire debris flows. Ongoing reductions of fuel loads can lessen the potential for severe fires in the long- term. Fuels treatment using prescribed fire may partially maintain surface vegetation and litter that promote soil stability. More than the other alternatives, Alternative B would employ low- intensity fire to treat fuels and, in turn, result in the greatest reduction of fuel loads.

Unavoidable Adverse Impacts
Severe fire could adversely affect soils and vegetation, increasing the potential for erosion and debris flows.

Impact Topic 8 (Air Quality)

Background and Methodology
Smoke from fires can be unhealthful, a regulatory problem, and view- obscuring.

A natural consequence of wildland fire is smoke- related air quality impacts. Smoke production varies with fuel type and condition, fuel quantity and area burned, fire behavior, and weather conditions. Repeated, small prescribed fires used to meet resource and protection objectives have minor direct, adverse impacts on air quality, but such impacts are considered short- term. Prescribed burns and wildland fire use must satisfy Arizona Department of Environmental Quality regulations. The use of prescribed fire for fuel reduction and resource- related purposes would reduce the likelihood of high- intensity, widespread wildfire and thus the chance for severe air quality impacts in the future. Smoke may actually benefit some monument plants; over the last decade, researchers have confirmed that chemicals in smoke trigger germination in species from Australia, South Africa, and the California chaparral (Brown and van Staden 1997).

In the absence of large, high- intensity wildland fires, the three alternatives (including the agency- preferred alternative) would potentially have the same relative impacts on air quality, given the schedule of prescribed fires is similar for all. Depending on wind speed, direction, and mixing height, the effects to downwind smoke load and visibility

may be a concern during prescribed burn actions. Under all alternatives, mitigation of adverse air impacts is mandatory.

Clear skies, both day and night, are a feature of the monument that affects visitor enjoyment. Views of pinnacles and of the rest of the Chiricahuas and other Sky Islands are a significant part of the visitor experience. Smoke would temporarily compromise these views and cloud the starry night sky. It could also hamper visitor enjoyment of the dark, starry night sky and possibly be a concern to hikers.

Air quality measurements are collected daily in the monument and have established clear sky norms. Knowledge of State of Arizona air quality regulations and experience meeting them with prescribed burns and wildfires is the basis of the assessment. The intensity and duration of effects are described in the analysis using the following criteria and definitions:

Negligible: The impact is at the lowest levels of detection. A fire management action (other than a wildfire) that is well within established State of Arizona Ambient Air Quality Standards, including visibility.

Minor: The impact is slight, but detectable. An action that meets all established State of Arizona Ambient Air Quality Standards, including visibility.

Moderate: The impact is readily apparent. An action that exceeds one or more established State of Arizona Ambient Air Quality and/or visibility standards. Would delay prescribed burns and require mitigation measures for wildland fire.

Major: The impact is severely adverse. An action that exceeds one or more established State of Arizona Ambient Air Quality and/or visibility standards. Mitigation measures required.

Impairment: A major, adverse impact to air quality that negates or contradicts (1) specific purposes identified in the establishing legislation or proclamation of Chiricahua National Monument; (2) the natural or cultural integrity of the monument; or (3) goals in the monument's general management plan or other relevant National Park Service planning documents.

Short- term: Within the duration of a specific fire program activity (for example prescribed burn or suppression action).

Long- term: Beyond the duration of a specific fire program activity.

Impacts of No Action Alternative

Impact Analysis
Under the No Action Alternative, most wildland fires would be suppressed, and fuels would continue to build up within the monument. Wildland fire use would be allowed in the small fire use FMU, but would not be allowed to spread outside of this area to achieve management objectives. Prescribed fire management would continue, but would be implemented only in the few designated prescribed fire units. Fuel loading within the monument would continue to increase both the amount of emissions from unplanned fires and the risk of fire potential. These emissions of air pollutants, including particulates and gases, would result in short- term, minor to moderate indirect adverse impacts to public health and visibility on an intermittent basis. Short- term, minor to moderate direct adverse impacts on air quality would also occur because localized emissions could exceed limits of some standards (e.g. particulates). Mitigation actions to minimize smoke would be carried out under this alternative, and adverse effects would decrease to minor levels as fuels activities are slowly reduced. On a regional basis, effects to air quality would generally include minor to moderate short-term adverse impacts, as large quantities of pollutants, primarily particulates, are released into the atmosphere and are transported beyond monument boundaries. Indirect effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive residents and visitors.

Under the No Action Alternative, the potential for high intensity wildfires exists during high severity fire season, with resulting increased emissions periodically originating on monument land. The potential for these high intensity fires is based on the continuing variance from historical conditions creating greater uncontrolled smoke production from the burning of accumulated fuels (e.g. denser tree canopies, deadfall, increased ladder fuels, increased litter and duff loading) that were historically reduced/removed by frequent wildland fires. This could result in moderate to major, adverse impacts.

Cumulative Effects
Cumulative effects would include smoke from other wildfires originating in the surrounding national forest and private lands, regional haze from the Douglas, AZ copper smelter, minor emissions from maintenance projects planned for the monument, particulates from the quartz quarry crushing/exploding of rock, and the potential for increased recreational and private development near the monument. These effects would cumulatively result in minor to moderate direct and indirect adverse effects to air quality, visibility, and plant/human health. The severity and duration of impacts would largely depend on the extent of fires in the area and whether these occurred at the same time. Cumulative impacts could be more intense under the No Action Alternative because of the increased potential for smoke emissions from the monument mixing with local and area source emissions.

Conclusion

The No Action Alternative would result in short- term, minor to moderate, adverse impacts to air quality and air quality- related values, resulting from more intense fires that would be expected to occur during the core summer burning period. These fires would emit air pollutants, smoke, and odors.

Under the No Action Alternative, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's General Management Plan or other relevant National Park Service planning document, there would be no impairment of the monument's resources or values.

Impacts of Alternative A (Corridor Plan)

Impact Analysis
Under Alternative A, wildland fires would be suppressed in the small corridor encompassing the first two miles of road and all historic and non- historic structures within 500 feet of the road corridor. Prescribed fire would be allowed in the entirety of the monument, and wildland fire use would be allowed in all areas except the road corridor FMU. Fuel reduction activities would include thinning, pile burning, and prescribed fires for hazard fuel reduction and resource management objectives.

Short- term, minor to moderate, indirect, adverse air quality impacts would occur in the area because of the potential for wildland fire occurrence coupled with prescribed fire activities. However, the potential for more intense impacts and longer- term impacts would decrease, since fewer areas would have high wildfire potential after appropriate prescribed fire treatments are implemented. These emissions of air pollutants, including particulates and gases, would result in impacts to public health and visibility on an intermittent basis. Short- term, minor to moderate direct adverse impacts on air quality would also occur because localized emissions could exceed limits of some standards (e.g. particulates). Wildland fire use would be conducted at optimum smoke dispersal periods to keep adverse impacts to a minimum. In addition, wildland fire use fires, depending on size, intensity and duration, may produce fewer emissions over an extended period of time.

Prescribed fire would be used throughout the monument, designated as a class 1 airshed by the Arizona Department of Environmental Quality. Mitigation efforts include burning during times of favorable transport winds, during times of low visitor use, and the utilization of the Best Management Practices as detailed in the *Arizona Department of Environmental Quality/Air Quality Division Smoke Management Guidelines*.
Prescribed fire operations will be conducted under conditions stipulated by the Arizona Department of Environmental Quality, including location, size, fuel type and loading, emission estimates for PM10 and PM2.5, plume modeling, duration, and limits of air

quality standards. The use of pile burning as well as mechanical equipment would also occur under this alternative, resulting in very minor emissions of pollutants from small fires and internal combustion engines. These emissions would result in short- term, negligible to minor, adverse impacts to air quality and air quality- related values.

Cumulative Effects
Cumulative effects would include smoke from other wildfires originating in the surrounding national forest and private lands, other fires occurring concurrently in the monument, regional haze from the Douglas, Arizona, copper smelter, minor emissions from maintenance projects planned for the monument, particulates from the quartz quarry crushing/exploding of rock, and the potential for increased recreational and private development near the monument. These effects would cumulatively result in minor to moderate, direct and indirect, adverse effects to air quality, visibility, and plant/human health. The severity and duration of impacts would largely depend on the extent of fires in the area and whether these fires occurred at the same time.

Conclusion
Under Alternative A, adverse impacts on air quality within the monument area would range from minor to moderate, but would be short- term and localized. Pile burning and prescribed burning would cause some adverse, direct, short- term, localized smoke and particulate matter emissions. However, fire potential would be reduced, resulting in beneficial effects in the long- term.

Under Alternative A, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's General Management Plan or other relevant National Park Service planning document, there would be no impairment of the monument's resources or values.

Impacts of Alternative B (Watershed Plan)

Impact Analysis
The impact analysis for Alternative B is similar to Alternative A, except that Alternative B includes approximately 5,300 acres of US Forest Service land. Under Alternative B, there would be more wildland fire use fires that could burn for a longer duration and over a larger area than wildland or prescribed fires. This could adversely affect air quality in the short- term; however, over the long- term, fires would be of less intensity as fuel loadings are reduced.

Alternative B would require additional mitigation measures for the ZOC, such as notification of burns to all grazing permitees on US Forest Service land and to campers/hunters in the vicinity.

Cumulative Effects
Cumulative effects for Alternative B are similar to Alternative A, but include additional cumulative effects of recreational vehicle usage and concentrated multiple hunting camps within and around the ZOC.

Conclusion
Under Alternative B, adverse impacts on air quality within the monument area would range from minor to moderate, but would be short- term and localized. Pile burning and prescribed burning would cause some adverse, direct, short- term, localized smoke and particulate matter emissions. However, fire potential would be reduced, resulting in long- term beneficial effects that would offset the moderate, short- term, adverse effects to air quality.

Under Alternative B, because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of proclamation of Chiricahua National Monument; (2) key to the natural or cultural integrity of the monument; or (3) identified as a goal in the monument's General Management Plan or other relevant National Park Service planning document, there would be no impairment of the monument's resources or values.

Irreversible/Irretrievable Commitments Of Resources
There would be no irreversible/irretrievable commitments of resources.

Loss in Long- Term Availability or Productivity of the Resource to Achieve Short- Term Gain
Fires at the monument would adversely affect local air quality in the short- term. Fires produce smoke in relation to fuel type and condition, fuel quantity and area burned, fire behavior, and weather conditions. Repeated, small prescribed fires used to meet resource and protection objectives would have adverse impacts on air quality, but such impacts are considered short- term. Alternative B would allow more frequent, low intensity fires in the short- term; in the long- term, there would be reduced risk of catastrophic fires and their resultant intense effects on air quality. The No Action Alternative, in allowing less fire in the short- term, would increase the potential of catastrophic fires in the long- term.

Unavoidable Adverse Impacts
Fire causes adverse impacts to air quality, such as the release of pollutants into the air, the production of smoke, and the alteration or obstruction of viewsheds. Effects would largely be temporary and localized. Mitigation would be employed to reduce adverse effects, but the effects could not be completely avoided.

Chapter V: Consultation and Coordination

The preparation of this Draft Environmental Impact Statement involved much interaction among many parties. Members of the inter- disciplinary team, in particular Carrie Dennett, Brooke Gebow, and Alan Whalon, met frequently between October 2001 and December 2002.

Scoping, Consultation, and Review
The IDT identified five fire management alternatives at its internal scoping meeting October 17–18, 2001. The Notice of Intent (NOI) for the proposed FMP appeared in the Federal Register January 31, 2002. A public comment period extended from January 31 to March 15, 2002, with public scoping meetings taking place on February 21 in Portal, Arizona, and on February 22 near the monument in Willcox. Agency and tribal consultation was initiated during public scoping.

Input from the public led to the development of a sixth scenario that the IDT have called the "watershed" alternative, which is the preferred alternative or Alternative B. If this alternative is adopted, a Memorandum of Understanding will be developed for cooperative activities in the ZOC.

The chronology below reviews scoping, outside consultation, and other milestones in support of this project.

10- 17- 01 & 10- 18- 01	Internal Scoping Meeting at Chiricahua National Monument
1- 30- 02	Initiate Endangered Species Act Section 7 (Sec 7) consultation with Fish and Wildlife Service (FWS)
1- 31- 02	Notice of Intent published in Federal Register
1- 31- 02 through 3- 15- 02	Public scoping comment period. Newsletter sent to public and tribes.
2- 21- 02	Public Scoping Meeting, Portal Fire & Rescue, 4- 6:30 p.m.
2- 22- 02	Public Scoping Meeting, El Dorado Community Room, (just west of monument entrance) 6- 8 p.m.

3- 10- 03	Biological Assessment (BA) submitted to FWS persuant to Sec 7 consultation requirements
3- 19- 03	Cultural Resources Component submitted to Arizona State Historic Preservation Office (SHPO) for National Historic Preservation Act Section 106 (Sec 106) compliance
5- 01- 03	Sec 106 concurrence received from SHPO
7- 17- 03	Peer review by Superintendents of Guadalupe Mountains National Park and Coronado National Monument
12- 12- 03	Worked with FWS to rewrite BA as a programmatic document for the entire fire management plan tenure
3- 25- 04	BA resubmitted to FWS
7- 23- 04	Biological Opinion received from FWS

The DEIS will be sent to agencies, tribes, organizations, as listed below. It will also be placed in the monument Visitor Center, as well as on the Chiricahua National Monument, National Park Service website. Notice will be placed in the federal register. Landowners adjacent to the monument, individuals, and other interested parties will be sent notification of the availability of the document, with information on how to obtain copies. Public comment will be received for at least 60 days.

Following the public review of the DEIS, a final EIS (FEIS) will be developed, unless a decision is made to terminate the EIS. In the FEIS, substantive issues and comments raised by the public or agencies will be thoroughly considered, addressed, or resolved.

List of Recipients

The following will receive hard copies of the Draft Environmental Impact Statement. Postcards will be sent to the full mailing list to inform interested parties of alternative methods of DEIS acquisition.

Coronado National Forest, Forest Supervisor
Coronado National Forest, Douglas District, District Ranger/Doug Hardy
National Park Service, Western Archeological and Conservation Center
Arizona Department of Environmental Quality, Smoke Manager/Peter Lahm
U.S. Fish and Wildlife Service, Mark Crites
State Historic Preservation Officer, Jim Garrison
Arizona Game and Fish Department, Joan Scott

Preparers/Inter- disciplinary Team (IDT)

Kathy M. Davis, *former Resources Manager, Southern Arizona Office, and current Superintendent Montezuma Castle National Monument*—Masters in Forestry from University of Montana, 22 years National Park Service, three years USFS, five years CSIRO in Australia. Responsible for NOI, fire ecology review, impact analysis review.

Carrie Dennett, *Ecologist, Chiricahua National Monument*—MS in Renewable Natural Resources Studies from University of Arizona, nine years National Park Service (Grand Canyon and Chiricahua), four years operations supervisor Biosphere II. Responsible for most of Chapter 4 impact analysis, fire ecology review, fire management unit definitions, prescribed fire planning including prescriptions, FWS consultation support, NOA.

Brooke S. Gebow, *Senior Research Specialist, University of Arizona School of Renewable Natural Resources*—MS in Ecology and Evolutionary Biology from University of Arizona, six years energy consulting, 12 years free- lance science writer, four years Tucson Botanical Gardens, five years project support for UA USGS Sonoran Desert Field Station. Responsible for overall document coordination, drafting chapters, coordinating related compliance documents and with other agencies, and soliciting and incorporating comments.

Michele Girard, *Ecologist, Southern Arizona Office*—PhD in Botany from North Dakota State University, 20 years USFS (Watershed Specialist, Prescott Forest; Ecologist on Bighorn, Shoshone, Black Hills, Nebraska, and Custer Forests; Research Ecologist, Rocky Mountain Experiment Station). Responsible for technical review.

Douglas Hardy, *District Ranger, Coronado National Forest Douglas Ranger District*—BS Forestry, Northern Arizona University, 28 years with USFS. 11 years District Ranger; 14 years District Range, Wildlife, and Watershed Staff Officer; 3 years timber marker, hotshot crew, initial attack engine supervisor, trail crew. Certified as Prescribed Fire Manager, USFS Region 9. Responsible for ZOC concerns and review of overall fire operations.

Kevin Harper, *Archeologist, Southern Arizona Office, National Park Service*—Masters in Anthropology from Northern Arizona University, three years National Park Service (Navajo National Monument and Southern Arizona Office). Eighteen years experience in cultural resources management with other federal, state, and tribal agencies. Responsible for cultural resources impact topics, production of Cultural Resources Component, and coordination with the Arizona SHPO.

Eva Long, *NEPA/106 Specialist, Intermountain Region, National Park Service*—BS in Applied Biology from Georgia Institute of Technology, nine years Environmental Protection Agency, four years National Park Service. Responsible for part of Chapter 4 impact analysis, and NEPA review.

Neil Mangum, *former Superintendent, Chiricahua National Monument*—Masters in History from University of New Mexico, 33 years National Park Service including Southwest Regional Historian, Superintendent Little Bighorn Battlefield. Responsible for overall process, tribal consultation.

Alan Whalon, *Chief of Resources Management and current Superintendent, Chiricahua National Monument* —MFS, Natural Resource Management from Yale University, 4 ½ years U. S. Air Force, private consulting forester, 25 years National Park Service (Acadia NP, Chaco Culture NHP, Big Cypress National Preserve, Hovenweep NM, Assateague Island NS, Hampton NHS). Responsible for cultural resources compliance, natural resources and socio- economic impact topics, inter- agency coordination, impact analysis review.

Chapter VI: References

Literature Cited

Arizona Game and Fish Department 2001. 2002- 2003 Arizona Hunting Regulations. Phoenix. 72 p.

Arizona Game and Fish Department. 1996. Wildlife of Special Concern in Arizona. Public review draft report of the Arizona Game and Fish Department Nongame Branch, Phoenix, AZ. 40 p.

Arizona Game and Fish Department. 1998. *Echinocereus ledingii*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 p.

Arizona Game and Fish Department. 1999. *Astragalus cobrensis* var. *maguirei*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 p.

Arizona Game and Fish Department. 2000. *Hedeoma dentatum*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 p.

Arizona Game and Fish Department. 2001a. *Graptopetalum bartramii*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 p.

Arizona Game and Fish Department. 2001b. *Hexalectris warnockii*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 p.

Arizona Rare Plant Committee. 2001. Arizona Rare Plant Field Guide: A collaboration of agencies and organizations. Coordinated by Mima Falk, USDA Forest Service, Coronado National Forest.

Bahre, C. J. 1991. A Legacy of Change: Historic Human Impact on Vegetation of the Arizona Borderlands. University of Arizona Press, Tucson. 231 p.

Baisan, C. H., and K. A. Morino. 1999. Fire history in Chiricahua National Monument. Final report to the National Park Service by the Laboratory of Tree- Ring Research, University of Arizona, Tucson. 21 p. + 18 figures.

Baker, M. B., Jr. 1990. Hydrologic and water quality effects of fire. P. 31- 42 in Krammes, J. S., tech coord. Effects of Fire Management on Southwestern Natural Resources. USDA Forest Service Gen. Tech, Rep. RM191. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Barton, A. M. 1996. The impact of fire on Arizona pine populations in Rhyolite Canyon, Chiricahua National Monument. Final report to the National Park Service and Southwest Parks and Monuments Association. 16 p.

Barton, A. M. 1999. Pines versus oaks: effects of fire on the composition of Madrean forests in Arizona. Forest Ecology and Management 120:143–156.

Bendell, J. F., 1974. Effects of fire on birds and mammals. P. 73- 138 in T. T. Kozlowski and C. E. Ahlgren, editors. Fire and Ecosystems. Academic Press, New York.

Bennett, P. S., R. R. Johnson, and M. R. Kunzmann. 1996. An annotated checklist of vascular plants of the Chiricahua Mountains. Special Report No. 12, USGS Sonoran Desert Field Station, The University of Arizona, Tucson. 228 p.

Black, B., and K. Neilsen. 1999. The legacy of the Civilian Conservation Corps in Chiricahua National Monument. P. 14- 15 in L. Benson and B. Gebow, editors. A Century of Parks in Southern Arizona. Second Conference on Research and Resource Management in Southern Arizona National Parks, Extended Abstracts. National Park Service, Southern Arizona Office and USGS Sonoran Desert Field Station, The University of Arizona, Tucson.

Bock, C. E., and J. H. Bock. 1990. Effects of fire on wildlife in southwestern lowland habitats. P. 50- 64 in Krammes, J. S., tech coord. Effects of Fire Management on Southwestern Natural Resources. USDA Forest Service Gen. Tech, Rep. RM191. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Brown, D. E., editor. 1994. Biotic Communities: southwestern United States and Northwestern Mexico. University of Utah Press, Salt Lake City. 342 p.

Brown, N. A. C., and J. van Staden. 1997. Smoke as a germination cue: a review. Plant Growth Regulation 22: 115- 124.

Carter, J. 1998. Apacheria chiricahuensis. *in* New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. http://nmrareplants.unm.edu (Version 15 March 2002).

Council on Environmental Quality. 1981. Forty Most Asked Questions Concerning Council on Environmental Quality's National Environmental Policy Act Regulations.

Dennett, C., K. Davis, and A. Whalon. 1998. Monitoring type description sheets (for prescribed burn program: mixed oak community, pine with mixed conifers and hardwoods, manzanita shrub community, mixed grasses with minor shrub- tree component). National Park Service. Chiricahua National Monument.

Dennett, C. L., D. Clark, and A. Whalon. 2000. Agave monitoring to determine effects of prescribed burning on this lesser long- nosed bat food source. P. 23- 24 in W. L. Halvorson and B. S. Gebow, editors. Creative Cooperation in Resource Management: Third Conference on Research and Resource Management in the Southwestern Deserts. Extended Abstracts. USGS Sonoran Desert Field Station, The University of Arizona, Tucson.

Denny, D. W., and C. R. Peacock. 2000. Soil survey of Chiricahua National Monument, Arizona. Technical Report No. 65, USGS Sonoran Desert Field Station, The University of Arizona, Tucson. 116 p.

Dobyns, H. F. 1981. From Fire to Flood: Historic Human Destruction of Sonoran Desert Riverine Oases. Ballena Press Anthropology Papers, no. 20. Socorro, NM.

Dodd, N. L. 1988. Fire management and southwestern raptors. P. 341- 347 in R. L. Glinski, and B. G. Pendleton [et al.], editors. Proceedings of the southwest raptor symposium and workshop. National Wildlife Federation Technology Series No. 11, Washington, D.C.

Erwin, W. J., and R. H. Stasiak. 1979. Vertebrate mortality during the burning of reestablished prairie in Nebraska. American Midland Naturalist 101:247- 249.

Felger, R. S., and M. B. Johnson. 1995. Trees of the northern Sierra Madre Occidental and Sky Islands of southwestern North America. P. 71- 83 in L. F. DeBano, P. F. Ffolliott, A. Ortego- Rubio, G. J. Gottfried, R. H. Hamre, and C. B. Edminster, tech. coords. Biodiversity and Management of the Madrean Archipelago: the Sky Islands of Southwestern United States and Northwestern Mexico. Gen. Tech. Rep.l RM- GTR-264. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Finch, D. M., J. L. Ganey, W. Yong, R. T. Kimball, and R. Sallabanks. 1997. Effects and interactions of fire, logging, and grazing. P. 103- 136 in W. M. Block and D. M. Finch, tech. coords. Songbird Ecology in Southwestern Ponderosa Pine Forests: a Literature Review. Gen. Tech. Rep. RM- GTR- 292, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Fischer, D. 1994. A checklist of birds of Chiricahua National Monument & Fort Bowie National Historic Site. Southwest Parks and Monuments Association.

Ganey, J. L., W. M. Block, and P. F. Boucher. 1996. Fire effects on birds in Madrean forests and woodlands. P. 146- 154 in P. F. Ffolliott, L. F. DeBano, M. B. Baker, Jr., G. J. Gottfried, G. Solis- Garza, C. B. Edminster, D. G. Neary, L. S. Allen, and R. H. Hamre, Technical Coordinators. Effects of Fire on Madrean Province Ecosystems. USDA Forest Service General Technical Report RM- GTR- 289. Fort Collins, CO.

Gile, L. H., and J. W. Hawley. 1966. Periodic sedimentation and soil formation of alluvial- fan piedmont in southern New Mexico. Soil Sci. Soc. Amer. Proc. 30:261–268.

Grange, W. B. 1948. The relation of fire to grouse. P. 193- 205 in Wisconsin Grouse Problems. Federal Aid in Wildlife Restoration Project No. 5R, publication 328. Wisconsin Conservation Department, Madison, WI.

Haskett, B. 1935. Early history of the cattle industry in Arizona. Arizona Historical Review 6(41):3–42.

Hastings, J. R., and R. M. Turner. 1965. The Changing Mile: An Ecological Study of Vegetation Change with Time in the Lower Mile of a Semi- Arid Region. University of Arizona Press, Tucson. 317 p.

Hibbert, A. R., E. A. Davis, and D. G. School. 1974. Chaparral conversion potential in Arizona. Part I: Water yield response and effects on other resources. Res. Pap. RM-126. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 36 p.

Johnson, P. W. 1962. Availability of water for Chiricahua National Monument, Cochise County, Arizona. U. S. Geol. Survey, Geol. Survey Water Supply Paper, 1475- H.

Jones, A. T., and R. C. Euler. 1986. Effects of forest fires on archaeological resources in Grand Canyon National Park. North American Archaeologist 7(3): 243- 254.

Kaib, M., C. H. Baisan, H. D. Grissino- Mayer, and T. W. Swetnam. 1996. Fire history in the gallery pine- oak forests and adjacent grasslands of the Chiricahua Mountains of Arizona. P. 253–264 in P. F. Ffolliott, L. F. DeBano, M. B. Baker, Jr., G. J. Gottfried, G. Solis- Garza, C. B. Edminster, D. G. Neary, L. S. Allen, and R. H. Hamre, Technical Coordinators. Effects of Fire on Madrean Province Ecosystems. USDA Forest Service General Technical Report RM- GTR- 289. Fort Collins, CO.

King, K. 2002. Chiricahua pinnacle vibration study. A report to Chiricahua National Monument. National Park Service.

Kruse, A. D., and J. L. Piehl. 1986. The impact of prescribed burning on ground- nesting birds. P. 153- 156 in G. K. Clambey and R. H. Pemble, editors. The Prairie: Past, Present, and Future, Proceedings, 9th North American Prairie Conference. Tri-College University Center for Environmental Studies, Fargo, ND.

Lehman, R. N., and J. W. Allendorf. 1989. The effects of fire, fire exclusion, and fire management on raptor habitats in the western United States. Western Raptor Management Symposium and Workshop:236- 244.

Lentz, S. C., J. K. Gaunt, and A. J. Willmer. 1996. Fire effects on archaeological resources, phase I: the Henry Fire, Holiday Mesa, Jemez Mountains, New Mexico. Res. Pap. RM- GTR- 273. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 103p.

Lowe, C. H. 1992. On the biogeography of the herpetofauna at Saguaro National Monument. P. 91–104 in C. P. Stone and E. S. Bellantoni, editors. Proceedings of the Symposium on Research in Saguaro National Monument. National Park Service, Rincon Institute, and Southwest Parks and Monuments Association.

Lowe, C. H., and R. G. Zweifel. 1992. Amphibians and reptiles of the Chiricahua Mountains, a sky island in the Madrean archipelago. P. 62–65 in A. M. Barton and S. A. Sloane, editors. Proceedings Chiricahua Mountains Research Symposium. Southwest Parks and Monuments Association, Tucson, AZ.

Mason, C. T. Jr. 1975. Apacheria chiricahuensis: a new genus and species from Arizona. Madroño 23:105- 108.

Mesta, R. 1999. Endangered and threatened wildlife and plants; final rule to remove the American peregrine falcon from the federal list of endangered and threatened wildlife, and to remove the similarity of appearance provision for free- flying peregrines in the conterminous United States. Federal Register 64(164):46542- 46558).

NPS. 1982. Fire Management Plan, Chiricahua National Monument. 49 p.

NPS. 1983. Departmental Manual 910.. National Oil and Hazardous Substances Contingency Plan.

NPS. 1996. Chiricahua National Monument Natural and Cultural Resources Management Plan

NPS. 2000. Statement of Findings for Executive Order 11988 "Floodplain Management," Bonita Creek Campground. [Appendix B General Management Plan, Environmental Impact Statement, Chiricahua National Monument.]

NPS. Director's Order #12. 2001. Conservation Planning, Environmental Impact Analysis, and Decision Making. Washington D. C.: U.S. Department of Interior.

NPS. 2001. Management Policies. National Park Service Office of Policy. 141 p.

NPS 2002. Wildland Fire Management Reference Manual 18. Version 3. November 5, 2002.

NPS. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274 p.

Parker, A. J. 1980. Site preferences and community characteristics of *Cupressus arizonica* Greene (Cupressaceae) in southeastern Arizona. Southwestern Naturalist 25:9- 22.

Pase, C. P. and P. A. Ingebo. 1965. Burned chaparral to grass: early effects on water and sediment yields form two granitic soil watersheds in Arizona. P. 8- 11 in Proceedings of the 9th Annual Arizona Watershed Symposium, Tempe, AZ.

Paysen, T. E., R. J. Ansley, J. K. Brown, G. J. Gottfried, S. M. Haase, M. G. Harrington, M. G. Narog, S. S. Sackett, and R. C. Wilson. 2000. Fire in western shrubland, woodland, and grassland ecosystems. P. 121–159 in J. K. Brown and J. K. Smith, editors. Wildland Fire in Ecosystems: Effects of Fire on Flora. Gen. Tech. Rep. RMRS- GTR-42- vol. 2. USDA Forest Service, Rocky Mountain Research Station, Ogden, Utah. 257 p.

Potter, L. D., and T. S. Potter. 1984. Post- fire recovery and mortality of the ponderosa pine forest after La Mesa Fire. P. 39- 55 in T. S. Fox, compiler. La Mesa Fire Symposium. Southwest Fire Council, National Park Service and Los Alamos National Laboratory, Los Alamos, NM.

Pyne, S. J., P.L. Andrews, R.D. Laven. 1996. Introduction to Wildland Fire. John Wiley & Sons, New York. 769 p.

Robbins, L. E., and R. L. Myers. 1992. Seasonal effects of prescribed burning in Florida: a review. Misc. Pub. No. 8. Tall Timbers Research, Inc., Tallahassee, FL. 96 p.

Rotenberry, J. T., R. J. Cooper, J. M. Wunderle, and K. G. Smith. 1995. When and how are populations limited? The roles of insect outbreaks, fire, and other natural perturbations. P. 55- 82 in T. E. Martin and D. M. Finch, editors. Ecology and Management of Neotropical Migratory Birds: A Synthesis of Critical Issues. Oxford University Press.

Seklecki, M. T., H. D. Grissino- Mayer, and T. W. Swetnam. 1996. Fire history and the possible role of Apache- set fires in the Chiricahua Mountains of southeastern Arizona. P. 238–246 in P. F. Ffolliott, L. F. DeBano, M. B. Baker, Jr., G. J. Gottfried, G. Solis- Garza, C. B. Edminster, D. G. Neary, L. S. Allen, and R. H. Hamre, technical coordinators. Effects of Fire on Madrean Province Ecosystems. USDA Forest Service General Technical Report RM- GTR- 289. Fort Collins, CO.

Simons, L. H. 1989. Vertebrates killed by desert fire. Southwestern Naturalist. 34: 144.

Singer, F. J., and P. Schullery. 1989. Yellowstone wildlife: populations in process. Western Wildlands 15:18- 22.

Singer, F. J., W. Schreier, J. Oppenheim, and E. O. Garton. 1989. Drought, fires, and large mammals. Bioscience 39:716- 722.

Smith, L. J., A. T. Holycross, C. W. Painter, M. E. Douglas. 2001. Montane rattlesnakes and prescribed fire. Southwestern Naturalist. 46(1): 54- 61.

Spicer, E. H. 1962. Cycles of conquest; the impact of Spain, Mexico, and the United States on the Indians of the southwest 1533 to 1960. University of Arizona Press, Tucson. 609 p.

Svedarsky, W. D., T. J. Wolfe, M. A. Kohring, and L. B. Hanson. 1986. Fire management in prairies in the prairie- forest transition of Minnesota. P. 103- 107 in A. L. Koonce, editor. Prescribed burning in the Midwest: State of the art (Symposium proceedings). University of Wisconsin- Stevens Point, College of Natural Resources, Fire Science Center, Stevens Point, WI.

Swetnam, T. W., C. H. Baisan, P. M. Brown, and A. C. Caprio. 1989. Fire history of Rhyolite Canyon, Chiricahua National Monument. Final report to Chiricahua National Monument from Laboratory of Tree- Ring Research, University of Arizona, Tucson, AZ. 38 p.

Taylor, A. H. 2003. Vegetation change in Chiricahua National Monument Arizona identified using repeat photography, phase I. Final report to the National Park Service by The Pennsylvania State University, University Park, PA. 15 p.+ 5 tables + 7 figures.

Todsen, T., and R. Spellenberg. 1999. *Hexalectris spicata* var. *arizonica*. *in* New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM:

New Mexico Rare Plants Home Page. http://nmrareplants.unm.edu (Version 15 March 2002).

Torres, L. and M. Baumler. 1984. Historic Structure Report, Historical and Archeological Data Sections, A History of the Buildings and Structures of Faraway Ranch, Chiricahua National Monument, Arizona. USDI, National Park Service, Denver Service Center.

Traylor, D., L. Hubbell, N. Wood, and B. Fielder. 1990. The 1977 La Mesa Fire study: an investigation of fire and fire suppression impact on cultural resources at Bandelier National Park. Southwest Cultural Resources Center, Professional Papers 28. Branch of Cultural Resources Management, Division of Anthropology, National Park Service, Santa Fe, NM. 206p.

USFWS. 1995a. Lesser long- nosed bat recovery plan. Albuquerque, New Mexico. 45 p.

USFWS. 1995b. Recovery plan for the Mexican spotted owl: vol. I. Albuquerque, New Mexico. 172 p.

USFWS. 2000. Jaguar. Abstract by Arizona Ecological Services Office, Paul Barrett, lead. http://ArizonaES.fws.gov/Documents/Redbook/Jaguar%20RB.pdf

USFWS. 2001a. Mexican gray wolf. Abstract by Arizona Ecological Services Office, Mary Richardson, lead. http://ArizonaES.fws.gov/Documents/Redbook/Mexican%20Gray%20Wolf%20RB.pdf

USFWS. 2001b. Northern aplomado falcon. Abstract by Arizona Ecological Services Office, Thetis Gamberg, lead. http://ArizonaES.fws.gov/Documents/Redbook/Northern%20Aplomado%20Falcon%20RB.pdf

USFWS. 2001c. Lesser long- nosed bat. Abstract by Arizona Ecological Services Office, Mike Coffeen, lead. http://ArizonaES.fws.gov/Documents/Redbook/Lesser%20Long-nosed%20bat%20RB.pdf

Vales, D. J., and J. M. Peek. 1996. Responses of elk to the 1988 Yellowstone fires and drought. P. 159- 167 in J. M. Greenlee, editor. The Ecological Implications of Fire in Greater Yellowstone, Proceedings, 2nd Biennial Conference on the Greater Yellowstone Ecosystem. International Association of Wildland Fire, Fairfield, WA.

Wagoner, J. J. 1975. Early Arizona: prehistory to Civil War. Univ. Ariz. Press, Tucson. 547 p.

Wright, H. A., and A. W. Bailey. 1982. Fire Ecology—United States and Southern Canada. John Wiley & Sons, New York. 501p.

Glossary

Biological Assessment	BA	An assessment presented to U.S. Fish and Wildlife Service of effects on federally listed species, proposed listed species, or critical habitats of proposed federal actions that are not major construction projects (in this particular case, implementing a new FMP is the proposed action)
Biological Opinion	BO	The opinion of the U.S. Fish and Wildlife Service on whether or not a proposed federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat
Context		The geographical or temporal environment of a proposed action, such that a change in the action relative to space or time might alter impacts
Coronado National Forest	CNF	USFS jurisdiction in southeastern Arizona
Cultural Landscape		Landscapes as affected by people through time— the definition of such captures overlapping occupancy by different groups of people
Cultural Resources		Valued aspects of a cultural system that might be tangible (districts, sites, structures, objects)
Cultural Resources Component	CRC	Document analyzing effects of the proposed action on cultural resources for review by the State Historic Preservation Office
Cumulative Effect		Effects of actions (those in the past, present, or reasonably foreseeable future) that have an additive impact on the resources affected by the proposed action
Debris Flow		"Rivers" of earth, rock, and debris saturated with water
Direct Effect		An impact that occurs as a result of the proposed action or alternative in the same place and at the same time as the action

Duration		The length of time of effects of an action
Ecoregion		A large- scale area with a common geological and biological history
Exotic Species		Species not native to a particular ecosystem
Fire Management Plan	FMP	The plan that guides all fire- related activities at a park that is consistent with land and resource management plans and follows NPS guidelines
Fire Management Unit	FMU	A delineated area of the park that permits particular fire management strategies
Fuel		Vegetation, both living and dead, capable of burning
Impairment		Impacts on resources that negatively, significantly, and possibly irreversibly alter their character from the state that made them important to protect in a park
Indirect Effect		An impact that occurs as a result of the proposed action, but removed in time and space from the action
Intensity		Magnitude of effect, from low to high
Inter- disciplinary team	IDT	Group of interdisciplinary specialists that identifies important issues, relationships, and alternatives for public scrutiny
Mechanical/manual Treatment		Removal of vegetation by mechanical or manual means (rather than by fire)
Minimum Requirement		The lowest impact means of accomplishing a task, frequently considered with respect to wilderness
Mitigation		Modification of an action that lessens intensity of its impacts on a particular resource
National Environmental Policy Act	NEPA	The 1969 law that dictates the objective analysis and public scrutiny of the environmental as well as social and economic impacts of proposed federal actions and their alternatives prior to implementation
Natural Resources		A feature of the natural (physical and

		biological) environment that has value to humans
No Action		Under NEPA, No Action continues the current planning and operational direction and provides a baseline against which other alternatives can be measured
Non- fire Treatments		Removal of vegetation without using fire, most commonly through mechanical/manual or herbicidal treatments
Non- native Species		Species not native to a particular ecosystem (used like “exotic”)
Pinnacles		At Chiricahua National Monument, eroded pillars of Rhyolite tuff that are beautiful, distinctive shapes and that are the resources whose uniqueness brought monument status to the area
Prescribed Fire		Fire ignited by management to meet specific objectives
Prescription		Measurable environmental criteria, particularly temperature, relative humidity, wind speed and direction, and fuel moisture, that define the conditions under which a prescribed fire would be ignited, guide selection of appropriate management responses, and indicate other required actions. Safety, economic, public health, geographic, administrative, social, or legal considerations would also affect decision making.
Protected Activity Center	PAC	Designated areas that are protected to benefit Mexican spotted owl (in the case of Chiricahua) by restricting certain management activities
Resource Advisor		An expert in a particular resource area (such as an archeologist or botanist) who is brought on site to advise fire crews relative to protecting sensitive resources
Scoping		Compilation of knowledge and opinions in

		order to properly develop and decide on alternative courses of action, both internally to the park and externally with the public
Sensitive Species		Species sensitive to perturbation from the proposed action, frequently rare species that are federal or state- listed, proposed for listing, occurring in very few places, or particularly sensitive to the action's impacts
Species Diversity		A measure of the number of species in an area (species richness) that also accounts for species abundance
State Historic Preservation Office	SHPO	The state office overseeing protection of cultural resources
Succession		The natural evolution of biotic communities over time following disturbance
Suppression		All the work of extinguishing a fire beginning with its discovery, using confine, contain, and control actions
Thinning		Reduction of density of vegetation, frequently using non- fire means
Timing		How effects vary depending on when the action takes place
U. S. Fish and Wildlife Service	USFWS	U.S. Department of Interior agency charged with overseeing protection of threatened and endangered species
Unique Sites		Sites sufficiently uncommon such that their presence is a special feature of the park with intrinsic value and of interest to visitors
Unique Stands		Patches of vegetation that are uncommon in an area that may be relicts from an earlier age
USDA Forest Service	USFS	U.S. Department of Agriculture (USDA) agency overseeing national forests (same as USFS)
Watershed		Land above a given point in a drainage that potentially contributes water to the streamflow at that point
Wilderness		Designated area managed to perpetuate

		natural processes and minimize human impacts
Wildland Fire Use		Naturally (lightning) ignited fire managed to meet resource benefits
ZOC	ZOC	Under the preferred alternative, an area of USFS land surrounding Chiricahua National Monument on the north, east, and south sides that is jointly managed by NPS and USFS for fire

Appendices

Six appendices appear here to support sections of this DEIS. Appendix I lists possible areas of environmental effect that the IDT considered before selecting eight impact topics for detailed analysis. Appendix II provides wildland fire use prescriptions for Alternatives A and B. Appendices III, IV, V, VI are more detailed analyses that back up the environmental consequences developed in Chapter IV.

Appendix I: Expanded List of Issues Related to Fire Management Planning Identified from the NPS Intermountain Region Environmental Screening Form (ESF)

Impact Area	Topics from ESF	Issues, Concerns, Opportunities
Human Experience & Interaction	**Visitor Experience**	
	safety	▪ fire can put visitors (and staff and firefighters) at risk ▪ fire use, prescribed fire, and thinning reduce hazard fuels
	mechanical noises	▪ equipment (chainsaws, helicopters, vehicles) will make noise during burns and suppression
	traffic	▪ fire may force road closures ▪ vehicles to support prescribed burning, wildland fire use or suppression efforts add to traffic in the park
	views	▪ sight of fire may frighten visitors ▪ aftermath may offend visitors ▪ fires and thinning can open areas and enhance scenic views
	recreation opportunities	▪ trails, vista points, and the campground might be temporarily closed during fire operations
	visitation	▪ visitors may elect not to come to the monument because of charred landscape post- fire
	interpretation	▪ fire operations and sites provide interpretive opportunities
	Land Use	
	property damage	▪ structures and landscaping are at risk
	neighbors	▪ fire may cross boundary to neighboring property ▪ smoke and helicopter noise may temporarily disturb neighbors during fire operations
	local economy	▪ local tourism could decline after a large, well- publicized fire
Cultural Resources	**Cultural Resources**	
	archeological sites	▪ fire might damage/uncover exposed sites and artifacts on the surface

Impact Area	Topics from ESF	Issues, Concerns, Opportunities
		▪ exposure following fire could allow for a more accurate inventory of cultural resources
	structures	▪ fire might damage or destroy significant fire- susceptible structures ▪ prescribed burning and manual thinning might protect historic structures and vulnerable prehistoric sites from the effects of wildland fire
	cultural landscapes	▪ fire might damage or kill fruit trees at Faraway Ranch ▪ prescribed and manual thinning could be used to restore historic landscapes and viewsheds.
Natural Resources	**Vegetation**	
	composition	▪ fire- intolerant species suffer ▪ fire- tolerant species benefit from decreased competition ▪ diversity increases post- fire with flush of forb growth
	structure	▪ intense fires can eliminate entire stands of vegetation ▪ presence of fire will cause fire- adapted species to increase; fire- intolerant species will decrease over time
	unique stands	▪ fire may damage or eliminate unique stands of vegetation when colonizing sources are no longer available
	non- native species	▪ fire facilitates invasion by undesirable Lehmann lovegrass and other fire- loving species into degraded habitats ▪ fire may prove to be a useful tool for control of non- native species
	Species of Special Concern	
	plants	▪ individuals or populations of rare, protected, or listed plants might suffer injury, death, or destruction of habitat by fire ▪ fire- adapted species might benefit from fire- reduced competition in vegetation stands; nutrient release may benefit

Impact Area	Topics from ESF	Issues, Concerns, Opportunities
		plants
	animals	▪ individuals or populations of rare, protected, or listed animals might suffer injury, death, or destruction of habitat by fire ▪ individuals and/or populations of species may benefit from fire- induced habitat renewal ▪ fire creates edge habitat preferred by some species
	Important Wildlife Considerations	
	key species	▪ fire might kill, injure, or temporarily displace key species that are part of the monument's attraction (hummingbirds, coatimundis, montane rattlesnakes) ▪ fire may benefit habitats of key species by thinning vegetation, causing flushes of new growth, exposing prey
	fire timing	▪ fire at a non- natural time of year may disrupt animal cycles ▪ fire during bird breeding season will cause nesting failures and mortality ▪ species adapted to cyclical fire will recover if sufficient populations exist for colonizing
	Unique Sites	
	ecoregions	▪ Madrean ecoregion species (those with south- of- the- border affinities that are present in very few parks in the U.S.) might suffer injury, death, or destruction of habitat by fire
	natural sites	▪ fire may change the character of one- of- a- kind features: springs, Silver Spur Meadow, Arizona cypress monoculture, old growth stands
	Wilderness	
	ecology	▪ permitting fire maintains natural succession processes
	visitor experience	▪ presence and effects of fire help maintain the integrity of wilderness
	fire operations	▪ when suppression is unavoidable in

Impact Area	Topics from ESF	Issues, Concerns, Opportunities
		wilderness, minimum impact and minimum tool analyses help determine course of action ▪ fire operations may bring people to closed areas ▪ fire use requires clearing backcountry visitors out of areas with limited access
	Geological Resources	
	pinnacles	▪ fire opens up views of pinnacles ▪ pinnacles may char in any kind of fire ▪ helicopter overflight used to aid suppression and prescribed burning is safe, but hovering next to pinnacles might create seismic disturbances that dislodge them ▪ heat might cause cracking or exfoliation
	soils	▪ high intensity fire may temporarily decrease infiltration and increase erosion ▪ low intensity fire may increase soil moisture through loss of vegetation, and release nutrients to soil ▪ handlines will expose soil to establishment by non- native plants and increase erosion on slopes
	Geohazards	
	mudflows	▪ potential for mudflows increases when intense storms hit fire- denuded slopes
	flooding	▪ intense storms after high- intensity or large fires increase runoff, but are unlikely to cause flooding due to high infiltration in these rocky landscapes ▪ risk of debris in flood flows increases after fires
	Water	
	quantity	▪ runoff increases post- fire with lack of intercepting and water- consuming vegetation
	quality	▪ runoff from fire- denuded slopes will contain increased particulate load

Impact Area	Topics from ESF	Issues, Concerns, Opportunities
	Floodplains/Wetlands	
	hydrology	▪ see "Water" and "Geohazards;"
	vegetation	▪ fire will cause short- term damage to and loss of individual wetland plants; fire will result in increased vigor of fire- adapted plant species which may improve watershed function
	wildlife	▪ fire can open up thickets that may ultimately dry up wet places ▪ fire can directly kill and injure wildlife inhabiting wetlands (bird nests are especially susceptible) ▪ fire- renewed habitat may re- attract former resident species
	Air Quality	
	smoke	▪ smoke can be a hazard or regulatory problem during fires ▪ smoke may be a germination agent for some plant species in the park
Federal & State Policies	**Agency Policies**	
	USDA Forest Service	▪ the monument and neighboring Coronado National Forest are cooperating on fire management and prepared for fire to cross boundaries from both directions
	U.S. Fish and Wildlife Service	▪ the monument works with USFWS on protection of threatened and endangered species
	Arizona SHPO	▪ the monument works with the Arizona State Historic Preservation Office on protection of cultural resources

Appendix II: Wildland Fire Use Prescriptions for Alternatives A and B

Season	Temp (°F)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction	1- hr TLFM	10- hr TLFM	100- hr TLFM	1,000- hr TLFM
March- June Pre- Monsoon	60- 85	20- 50	<8	Any	4	5	10	15
July- September Monsoon	60- 95	15- 50	<10	Any	3	4	8	12
Oct- Feb Winter	50- 85	15- 50	<8	Any	3	4	8	12

TLFM = time- lag fuel moisture

1- hour TLFM fuels require only a short time to respond to changes in environmental moisture conditions (finer fuels 0- 1/4 in diameter).

1,000- hour TLFM fuels require a long time to respond to changes in environmental moisture conditions (fuels > 3 in diameter).

Appendix III: Sensitive Plant & Animal Species

Sensitive Plants at Chiricahua National Monunment

Apacheria chiricahuensis (Crossosomataceae)
Regulatory Status: salvage- restricted under Arizona Native Plant Law
Chiricahua rock flower inhabits crevices, ledges, and outcrops of mostly north- facing rhyolite and limestone cliffs (Bennett et al. 1996; Carter 1998). It occurs in widely scattered populations in southwestern New Mexico and in the Chiricahuas (Carter 1998). Bennett et al. (1996) list the plant from Picket Canyon, Hunt Canyon, and the Heart of Rocks trail in the monument. "The cliffside habitats of this rare shrub offer considerable protection from human impacts" (Carter 1998). The plant is a recent discovery; Mason (1975) first described the monotypic genus.

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Astragalus cobrensis var. maguirei (Fabaceae)
Regulatory Status: USFWS species of concern; USFS sensitive species; salvage-restricted under Arizona Native Plant Law
Coppermine milk- vetch occurs in "[s]hady canyons (near stream bottoms) and lower ledges both in full sun (often on rocky soils) and in the shade (found on more organic soils composed of leaf litter)" (Arizona Game and Fish Dept. 1999). The plant is found in pinyon pine/alligator juniper, alligator juniper/mixed oak, Apache pine/ponderosa pine, and transition communities. The canyon- bottom habit makes it susceptible to human and natural disturbances. Bennett et al. (1996) report it from Bonita, East Whitetail, and Pinery canyons in the monument; type locality is Whitetail Canyon. Coppermine milk-vetch also occurs in the Peloncillo Mountains and possibly the Pinalenos.

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant was present in the same habitats before the fire suppression era, it likely survived the low- intensity, mosaic- pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain coppermine milk- vetch.

Echinocereus ledingii (Cactaceae)
Regulatory Status: salvage- restricted under Arizona Native Plant Law
Pinaleno hedgehog cactus occurs in the mountains of southeastern Arizona between 4,000 and 7,400 ft elevation. It lives in cracks and crevices of rocks or in decomposed rock at the base of outcrops on 20- 50° slopes, among boulders (Arizona Game and Fish Department 1998). It occupies openings in grassland, woodland, and chaparral habitats

(Bennett et al. 1996). At Chiricahua the cactus has been found in West Whitetail and Woods canyons.

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Graptopetalum bartramii (Crassulaceae)
Regulatory Status: USFS sensitive species; salvage- restricted under Arizona Native Plant Law
Bartram stonecrop grows in cracks on rocky outcrops along arroyos and canyons between 3,650 and 6,700 ft elevation (Arizona Rare Plant Committee 2001). Habitat is shrub live oak- grassland or in litter and shade in Madrean evergreen woodland (Arizona Game and Fish Department 2001). The succulent rosettes form small clusters; these perennial plants reproduce both via a flowering stalk and vegetatively. The plant is recorded from Coronado National Forest about one mile east of the monument boundary, near the ZOC.

Fire considerations: The plant's preference for rocky places should protect it from fire. Illegal collecting is the main management issue (Arizona Game and Fish Department 2001). Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Hedeoma dentatum (Lamiaceae)
Regulatory Status: USFS sensitive species
Mock- pennyroyal occurs in southeastern Arizona and northern Sonora, Mexico primarily in oaks, pine- oak woodland, and pines, but also semi- desert grassland (Arizona Game and Fish Department 2000). It is uncommon in sunny woodland clearings and wooded canyons on well- drained soils; at Chiricahua it is known from Little Jesse James, Bonita, and Echo canyons (Bennett et al. 1996).

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant was present in the same habitats before the fire suppression era, it likely survived the low- intensity, mosaic- pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain mock- pennyroyal.

Hexalectris spicata (Orchidaceae)
Regulatory Status: salvage- restricted under Arizona Native Plant Law
Crested coral root occurs in southeastern Arizona, southern New Mexico, Texas, and Coahuila, Mexico (Todsen and Spellenberg 1999). Bennett et al. (1996) call it a "saprophytic geophyte," while Todsen and Spellenberg (1999) describe its habitat as "…heavy leaf litter in oak, pine, or juniper woodlands over limestone." Bennett et al.

(1996) place it in Jesse James Canyon "1/3 mi. south of the Chiricahua Nat. Mon. boundary." Two varieties (*spicata* and *arizonica*) of *Hexalectris spicata* occur in the monument (Coleman 2002).

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant was present in the same habitats before the fire suppression era, it likely survived the low- intensity, mosaic- pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain crested coral root.

Hexalectris warnockii (Orchidaceae)
Regulatory Status: USFWS species of concern; USFS and BLM sensitive species; highly-safeguarded under Arizona Native Plant Law
Texas purple spike is known from west Texas, southern New Mexico, southeastern Arizona, and Baja California, Mexico (Arizona Game and Fish Department 2001). For a long time, Rhyolite Canyon in the monument was its only known location in Arizona, but it has also been found in the Huachuca and Mule mountains (Arizona Game and Fish Department 2001). Bennett et al. (1996) state: "Population near Chiricahua National Monument headquarters in Rhyolite Canyon was apparently destroyed by past construction activities. A population nearby has apparently survived but is uncollected."

Fire considerations: While this plant's oak woodland habitat benefits from fire, Texas purple spike is known from one location near park headquarters and a second location about ¼ mi to the east, in areas that would be protected from fire under any fire management alternative.

Perityle cochisensis (Asteraceae)
Regulatory Status: USFS sensitive species; salvage- restricted under Arizona Native Plant Law
Chiricahua rock daisy, apparently endemic to the Chiricahuas and Dos Cabezas mountains, lives on moist, north- facing cliffs between 5,500 and 7,000 ft elevation (Arizona Rare Plant Committee 2001). It occurs among oaks and cypresses and is known from the Organ Pipe and Echo Canyon Trail areas (Bennett et al. 1996).

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Sensitive Animals at Chiricahua National Monument

Accipiter gentiles

Regulatory Status: USFWS species of concern; USFS sensitive species; wildlife of concern in Arizona
Northern goshawk is known to nest in pine- oak habitat in southeastern Arizona (Arizona Game and Fish Department 1996). It is listed as rare resident on Chiricahua bird list. Loss of nesting habitat—large, mature trees—is a concern of the Arizona Game and Fish Department.

Fire considerations: Prescribed burns and other fuels treatments should prevent high-intensity fires that might threaten large, mature trees. Low- or moderate- intensity fires should renew habitat for prey species. Mammal surveys getting underway in 2002 will test this hypothesis.

Canis lupis baileyi
Regulatory Status: USFWS endangered
Mexican gray wolves were eliminated from southwestern U.S. by around 1950 as a result of predator control programs. Historically the subspecies occurred in southeastern Arizona, southwestern New Mexico, southwestern Texas, and through the Sierra Madre of Mexico. Wolves inhabit oak and pine/juniper savannas in the foothills and mixed- conifer woodlands above 4,000 ft (USFWS 2001). The Mexican gray wolf was listed as endangered without critical habitat. An experimental population was introduced into the Blue River Primitive Area, located on the Apache- Sitgreaves and Gila National Forests, in the hopes of re- establishing the species.

Fire considerations: The wolves are not known to occur in the monument, but should any travel through, fire is not likely to directly affect them due to their great mobility. Indirectly, fire could lessen their cover in travel areas or corridors and locally reduce small mammal prey species in the short- term.

Falco femoralis septentrionalis
Regulatory status: USFWS endangered
The northern aplomado falcon was not seen in the U.S. between 1952 and 1997. It formerly occurred in Cochise County. Habitat is open grassland between 3,500 and 9,000 ft elevation. Conversion of grassland habitat to shrublands, overcollecting, and DDT- induced reproductive failure explain its severe decline. A reintroduction program was initiated in south Texas beginning in 1993. "A small population has been confirmed in northern Chihuahua and Tamaulipas, Mexico, and several confirmed sightings have been made in New Mexico and Texas, but not Arizona, since 1995" (USFWS 2001). In 2002, at least one nesting pair is known to occur on a ranch in New Mexico.

Fire considerations: While Chihuahuan Desert grassland is potentially suitable habitat for this bird, the small (less than 1,000 ac) of Lehmann- lovegrass- dominated grassland patches in the canyon bottom or on hillsides are not likely to be used by any falcon that might fly to the monument, especially with more suitable Sulphur Springs Valley grasslands (about 900,000 ac) directly adjacent to the monument.

Falco peregrinus anatum
Regulatory Status: USFWS species of concern; USFS Sensitive; wildlife of concern in Arizona. The American peregrine falcon was delisted in 1999 after recovering from a precipitous, post- World War II decline. DDT and other persistent organochlorines caused high rates of reproductive failure in the falcon that led to its listing as endangered in 1970. In the years prior to delisting, population target numbers were exceeded two-fold in Arizona (Federal Register 8- 25- 1999). It is currently considered a rare resident of Chiricahua National Monument (Fischer 2002); the falcon was resident in Bonita Canyon in 1979, upper Rhyolite in 1986, and Ancient Lake Bed in 1993. Peregrines feed on birds and occasionally bats hunted from the air. Ledges on cliffs are traditional nesting habitat, but since the 1980s, birds have nested on equivalent man- made structures in urban areas.

Fire considerations: Prescribed burns and other fuels treatments should prevent high-intensity fires in areas used by peregrines. Traditional nesting sites are relatively safe from fire. Low- or moderate- intensity fires should renew habitat for prey species.

Leptonycteris curasoae yerbabuenae
Regulatory status: USFWS endangered
The lesser long- nosed bat is a federally listed endangered species that ranges from central Arizona and southwest New Mexico through Mexico to El Salvador. It feeds on nectar, pollen, and fruit of paniculate agaves and columnar cacti. Palmer's agave *(Agave palmeri)* in the monument is a locally important food plant. Its modern and historic ranges are equivalent; however, numbers of occupied roosts and individuals per roost have dropped dramatically (USFWS 2001). Roosts have not been found in the CNM. A transitory night roost has been identified in the old Kasper Mine Tunnel (T16S, R30E, Sec. 33) approximately 1 mile east of CNM/CNF border, just beyond the ZOC. Greater than 1,000 bats are known to use this roost. Recent monitoring by the Forest Service has been limited and shows night use, though day use is also likely. This location is along the eastern flank of the Chiricahua Mountains, and it is likely that bats forage to the east where lower elevation grasslands and agave plants are nearer and more numerous. An unnamed mine shaft (part of Hilltop Complex) exists 1.5 miles east of monument- forest border; its use as a spring and summer migratory day roost dates back to at least the late- 1960s.

There is another large colony roost seven miles east of the monument at lower elevation on private land, and a smaller colony roost site six miles north at the very northern end of the Chiricahua Mountains. There are no caves other than very small alcoves within the monument or these burn units. There are no roosts found in the abandoned mines in the area (King of Lead Mine, T16S, R30E, Sec. 18). Lesser long- nosed bats have been seen in small numbers at hummingbird feeders within the monument. It is probable that these individuals travel from the known roosts, or more distant sites, for nighttime foraging.

Fire considerations: Fire is not likely to directly affect any bats that may occur in the monument due to their mobility and active prevention of fire at cave and mine sites. Fire can indirectly affect the bats by destroying Palmer's agave (*Agave palmeri*). Where hot-burning, non- native Lehmann lovegrass is the dominant grass surrounding them, fire puts agaves at higher risk for destruction. Less- destructive burning, such as would occur in a grassland of native species, would not necessarily consume the plant. The monument has committed to the U.S. Fish and Wildlife Service to keep agave mortality from prescribed fire at less than 20% of the plants in any given location (see Chapter V, Lesser long- nosed bat foraging area subtreatments, under the [backcountry] FMU 2 description).

Panthera onca
Regulatory status: USFWS endangered
The jaguar was listed as endangered in the United States in March 1972. Shooting, predator control, and habitat loss are thought to have reduced populations historically in the Southwest (USFWS 2000). Individual jaguars have been seen and photographed infrequently in southern Arizona during the last few decades. Observers have spotted the cats in Sonoran desertscrub up through subalpine conifer forest; there was a 1996 sighting in Cochise County. It is possible jaguars may travel in and through the monument.

Fire considerations: Fire is not likely to directly affect jaguars due to their mobility. Fire could indirectly hamper their travel and deplete foraging cover, and a localized change in deer patterns on the landscape may occur as forage burns and re- sprouts later in the growing seasons following a fire.

Strix occidentalis lucida
Regulatory status: USFWS threatened; USFS sensitive species; wildlife of special concern in Arizona
Mexican spotted owl is distributed from central Mexico through the mountains of Arizona, New Mexico, and west Texas, and into southern Utah and Colorado. Most of the literature portrays preferred habitat as mature montane forest and woodland and steep canyons, but there are areas in the Southwest with owls that have different features—like pinnacles at Chiricahua. The Mexican spotted owl, one of three subspecies, is listed as threatened by both the USFWS and the Arizona Game and Fish Department. Chiricahua National Monument is included in the critical habitat designation; monument records from December 1973 to 1994 include a total of 21 spotted owl visual sightings or vocalizations. All of these occurred within the area now designated as the Shake Spring protected activity center (PAC). The results of these surveys in the monument indicate the strong possibility of a single resident female that uses the two designated PACs (Shake Spring and Echo Canyon).

Fire considerations: Fire is not likely to directly affect Mexican spotted owls due to their mobility. Smoke, heat, loss of owl prey species (due to loss of prey species habitat), and noise could have indirect effects. Smoke will be managed according to Arizona Department of Environmental Quality's (ADEQ) permit requirements. Fire operations must proceed with helicopter flights over PACs 500 ft AGL during the nesting season (March through August). By conducting low- intensity prescribed fire, and managing natural ignitions to meet the low heat objectives in the burn plan, (including fitting appropriate fire prescriptions), the monument will minimize heat effects to known owls. Resource advisors with knowledge of Mexican spotted owls must be onsite during burning operations and will participate in decisions relating to escaped prescribed fire and suppression actions. Loss of prey species will likely occur in burned areas for the first growing season, post- burn. Monsoon rains will allow grasses and forbs to grow, with small mammals fully expected to return to pre- burn numbers. Canopy closure in the habitat is expected to remain the same percent after burning.

Appendix IV: Fire Effects on Vegetation

Table 1. Pine with Mixed Conifer and Hardwoods: Fire Ecology of Species. FEIS is the Fire Effects Information System maintained by the USFS that contains literature reviews: http://www.fs.fed.us/database/feis/. Asterisk (*) denotes observation by Chiricahua National Monument staff.

Species	Fire Ecology/Adaptations	Source
Dominant trees (at least 20% of the overstory dominant stands or mixtures of these species)		
Pinus englemannii	Mature Apache pine endure most fires and become dominant when fire- susceptible species are eliminated. Species debarks.*	FEIS
Pinus leiophylla var. chihuahuana	Chihuahua pine endures and regenerates after fire due to thick bark, abundant seed production, delayed seed release from semi-serotinous cones, and sprouting potential, even in mature trees. When pine- oak woodland is burned, fire- enduring species such as Chihuahua pine survive to become dominant since the less tolerant species are eliminated.	Barton 1999; FEIS
Pinus arizonica	Debarks; has semi- serotinous cones.*	
Associated trees		
Arbutus arizonica	Arizona madrone's thin bark suggests the tree is damaged by fire; however, 8 fire scars were observed on a tree seen in the Chiricahuas. Madrone colonizes fire sites with seed from off- site. Resprouts.*	FEIS
Pinus discolor		
Pinus edulis	Colorado pinyon is generally very susceptible to fire damage depending on stand structure and understory; it is absent from post- fire early successional stages. Seedlings establish primarily via the postburn food caches of birds and rodents; successful establishment requires a nurse plant.	FEIS

Table 1. Pine with Mixed Conifer and Hardwoods: Fire Ecology of Species (continued).

Species	Fire Ecology/Adaptations	Source
Pseudotsuga menziesii	Mature Rocky Mountain Douglas- fir is generally more fire resistant than spruces and true firs and equally or slightly less fire resistant than ponderosa pine. Mature trees can survive moderately severe ground fires because thick, corky bark insulates the cambium from heat damage. Where fire is frequent young trees don't survive. Low growing branches and flammable foliage make trees susceptible to crowning.	FEIS
Quercus arizonica	Arizona white oak sprouts from the root crown or stump following fire.	FEIS
Quercus emoryi	Emory oak is adapted to recurrent fires. It sprouts from the root crown or stump and grows vigorously following fire	FEIS
Quercus hypoleucoides	Silverleaf oak sprouts after fires; where fires are frequent and/or intense, above ground biomass is less than where fires are infrequent or not intense.	Barton 1999
Quercus rugosa	Netleaf oak resprouts after fire; top- survival was zero in a study of 4 oak species (survival of 5 cm dbh stems of *Q. hypoleucoides*, *Q. arizonica*, *Q. emoryi was* 20- 60%).	Barton 1999
Shrub layer		
Rhamnus betulaefolia		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification. Layering observed.*	FEIS
Garrya wrightii	Wright silktassel sprouts from the root crown following top- kill by fire.	FEIS

Table 1. Pine with Mixed Conifer and Hardwoods: Fire Ecology of Species (continued).

Species	Fire Ecology/Adaptations	Source
Grasses		
Muhlenbergia emersleyi	Bull muhly coverage and frequency were reduced on 3- year- old burns but not significantly different on 6- 7- year- old burns when compared with unburned partner sites.	Ahlstrand 1982
Muhlenbergia longiligula		
Piptochaetium fimbriatum		

Table 2. Mixed Oak: Fire Ecology of Species. Asterisk (*) denotes observation by Chiricahua National Monument Staff.

Species	Fire Ecology/Adaptations	Source
Dominants (at least 60% of the overstory)		
Quercus arizonica	Arizona white oak sprouts from the root crown or stump following fire.	FEIS
Quercus emoryi	Emory oak is adapted to recurrent fires. It sprouts from the root crown or stump and grows vigorously following fire.	FEIS
Quercus hypoleucoides	Silverleaf oak sprouts after fires; where fires are frequent and/or intense, above ground biomass is less than where fires are infrequent or not intense.	Barton 1999
Other species		
Cupressus arizonica	Low- intensity surface fires are lethal to Arizona cypress with stem diameters less than 4 inches (10 cm). Larger trees are also not very resistant to fire. Surface fires kill all seeds in cones on the forest floor. Leaves don't burn when dead.*	FEIS
Juniperus deppeana	Alligator juniper canopies are often high enough so that fires scorch but do not severely damage the crown. Bark also provides protection from fire. It is generally capable of prolific sprouting after aboveground vegetation is consumed by fire, particularly if the "resprouting zone" is covered by soil.	FEIS
Pinus englemannii	Mature Apache pine endure most fires and become dominant when fire-susceptible species are eliminated.	FEIS
Pinus leiophylla var. *chihuahuana*	Chihuahua pine endures and regenerates after fire due to thick bark, abundant seed production, delayed seed release from semi- serotinous cones, and sprouting potential, even in mature trees. When pine- oak woodland is burned, fire- enduring species such as Chihuahua pine survive to become dominant since the less tolerant species are eliminated.	Barton 1999; FEIS

Table 2. Mixed Oak: Fire Ecology of Species (continued).

Species	Fire Ecology/Adaptations	Source
Quercus rugosa	Netleaf oak resprouts after fire; top- survival was zero in a study of 4 oak species (survival of 5 cm dbh stems of *Q. hypoleucoides, Q. arizonica, Q. emoryi was* 20- 60%).	Barton 1999
Quercus turbinella	This oak typically resprouts vigorously from the root crown and rhizomes in response to fire or other disturbance. Postfire establishment by seed also occurs.	FEIS
Quercus gambelii	Gambel oak is a fire- adapted species. It responds to fire by vegetative sprouting from the lignotuber and rhizomes. Tree forms may survive low- severity fire	FEIS
Quercus toumeyi		
Shrubs		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification.	FEIS
Acacia greggii	Catclaw acacia is fire- tolerant and can rapidly recover by sprouting even after repeated burns.	FEIS
Garrya wrightii	Wright silktassel sprouts from the root crown following top- kill by fire.	FEIS
Rhamnus betulaefolia		
Rhamnus californica ssp. *ursina*	Following fires which kill aerial stems, California coffeeberry sprouts vigorously from dormant buds located on the rootcrown, enabling it to rapidly reoccupy the initial postburn environment.	FEIS
Rhus spp.	Most species of sumac are very tolerant of fire due to a capacity for sprouting.	FEIS
Grasses		
Muhlenbergia spp.		
Piptochaetium fimbriatum		

Table 3. Manzanita Shrub Community: Fire Ecology of Species.

Species	Fire Ecology/Adaptations	Source
Predominant species		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification.	FEIS
Grasses		
Muhlenbergia emersleyi	Bull muhly coverage and frequency were reduced on 3- year- old burns but not significantly different on 6- 7- year- old burns when compared with unburned partner sites.	Ahlstrand 1982
Muhlenbergia longiligula		

Table 4. Mixed Grasses with Minor Shrub/Tree Component: Fire Ecology of Species.

Species	Fire Ecology/Adaptations	Source
Grasses		
Bouteloua gracilis	When warm- season grasses such as blue grama are burned while dormant, living plant parts are often unaffected. Reestablishment occurs through rhizomes, which may be unaffected or even stimulated by fire, and by germination of wind- dispersed, water-dispersed, or animal- dispersed seed	FEIS
Bouteloua curtipendula	Response to fire depends on growth form, climatic conditions, season of burn, and severity of fire. Reestablishment occurs through seed and/or rhizomes. Recovery time is variable, but 2 to 3 years may be required	FEIS

Table 4. Mixed Grasses with Minor Shrub/Tree Component: Fire Ecology of Species (continued).

Species	Fire Ecology/Adaptations	Source
Bouteloua hirsuta	Hairy grama cover was positively correlated with fire frequency in Minnesota; most studies conclude it is undamaged by fire following a season or two of depressed production.	FEIS
B. radicosa		
B. repens		
Eragrostis lehmanniana	Non- native Lehmann lovegrass seeds stored in the soil germinate abundantly post- fire, even after hot fires kill mature plants. Surviving plants frequently resprout. Post- fire densities can be higher than pre- fire. Recovery from fall burning slower than other seasons. Burns hot enough to kill shrubs.	FEIS
Shrubs (less than 40% cover)		
Acacia greggii	Catclaw acacia is fire- tolerant and can rapidly recover by sprouting even after repeated burns.	FEIS
Baccharis pteronioides		
Garrya wrightii	Wright silktassel sprouts from the root crown following top- kill by fire	FEIS
Ephedra trifurca		
Ericameria laricifoloia	Turpentine bush showed little recovery two growing seasons after fire.	Cable 1973
Prosopis glandulosa	Honey mesquite plants are very tolerant of intense fires by the time they are 3.5 years of age. Mature plants contain numerous, dormant buds on an underground stem, generally located just below the soil surface, where they are sufficiently insulated from the heat of most fires. Following top- kill by fire, numerous sprouts arise from the underground buds.	FEIS
Senecio douglasii		

Appendix V: References in Addition to Fire Effects Information System

Ahlstrand, G. M. 1982. Response of Chihuahuan Desert mountain shrub vegetation to burning. J. Range Management 35:62–65.

Barton, A. M. 1999. Pines versus oaks: effects of fire on the composition of Madrean forests in Arizona. Forest Ecology and Management 120:143–156.

Cable, D. R. 1973. Fire effects in Southwestern semidesert grass- shrub communities. Proceedings of the Tall Timbers Fire Ecology Conference 12:109–127.

Appendix VI: Cultural Resources at Risk from Fire

This matrix was:
Generated by Carrie Dennett, Brooke Gebow, Bill Halvorson, Kate Neilsen, and Alan Whalon 12- 01; reviewed by Trinkle Jones of NPS Western Archeological Conservation Center 6- 02; modified by Jones, Gebow, and Whalon 8- 02; reviewed by archeologist Kevin Harper of NPS Southern Arizona Office 9- 02; sent to the Arizona SHPO 3- 10- 03 as part of a Cultural Resources Component (document summarizing FMP cultural resources concerns).

This matrix describes the cultural resources at Chiricahua National Monument that are sensitive to fire program activities, specifies the particular aspects at risk, reviews what fire program activities create the risk, defines protection objectives for these resources, and suggests methods to minimize or mitigate impacts in order to achieve the objectives.

Definitions of terms:

Historic contexts are the historic and prehistoric themes under which various resources were created and used. Individual resources are best understood and evaluated by understanding the roles they played within specific historical framework s. In Table 1, the Pre- Apache context covers resources dating from before the arrival of the Apache around 1500.

Resource types represent general function or morphology. The exact function may not be known, especially for prehistoric resources. In Table 1, caves are a specific resource type that are the setting for a number of different elements.

Elements are the specific physical characteristics of resource types. Identifying the elements allows us to define specific *elements or values at risk* from various fire management activities. In Table 1, the IDT lists four specific elements under the cave resource type: pictographs, lithic scatter, textile fragments, and pottery.

Risk conditions or activities are the specific environmental conditions and/or fire management activities that place particular resources at risk. In Table 1, ground disturbance, erosion, and fuel accumulation are listed as putting lithic scatters at risk.

Fire management objectives guide actions in a way that protects the elements or values at risk. Table 1 recommends suppressing fires and avoiding disturbance where textile fragments might be present in caves.

Treatments or prescriptions are methods of attaining the objectives. In Table 1, for fire-proof manos and metates, no special treatments or prescriptions are necessary.

Table 1. Historic Context: Pre- Apache

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
caves	pictographs	date contamination, feature integrity, interpretive value	heat, soot, combustible vegetative material (loss of screening), retardant drop	suppression, fuel reduction minimizing risk from retardant drops	construct line, manual thinning
	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict suppression activities, low-intensity prescribed burns
	textile fragments	feature integrity	heat, soot, ground disturbance	suppression, avoid disturbance	thin fuels, restrict suppression activities
	pottery	feature integrity	heat, soot, ground disturbance	suppression, avoid disturbance	thin fuels, restrict suppression activities
petroglyphs	petroglyphs	date contamination, feature integrity, interpretive value	heat, soot, fuel accumulation	suppression, reduce fuels	thin fuels, construct line
villages	mano & metate	none	none	allow to burn	none
	irrigation system	feature integrity	ground disturbance, erosion	allow low- to moderate intensity fire, avoid disturbance, reduce fuels	thin fuels, avoid line construction
	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities, low-intensity prescribed

					burns
	rock mounds	spatial arrangement, interpretive value	ground disturbance, erosion, combustible vegetative material (burning roots)	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities
work sites	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities

Table 2. Historical Context: Apache (1500–1887)

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
caves	baskets and other combustibles	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, mechanically reduce fuels around mouth
	pottery	radiocarbon date contamination, spatial arrangement	heat, soot, ground disturbance	avoid disturbance	restrict hand lines
	rock art	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, mechanically reduce fuels around mouth
	middens with perishable contents	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, manually reduce fuels around mouth
villages	combustibles	feature integrity, vegetative identification	combustible material	avoid ground disturbance	restrict line construction
	stone tools, sherds	feature integrity, dating	heat, soot	avoid ground disturbance	line construction around site
work sites, limited activity sites	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance, protect from erosion	thin fuels, restrict suppression activities unless slopes > 15%
springs	vegetation, hydrology	radiocarbon date contamination, spatial arrangement	ground disturbance, vegetation change	regular burning	none

Table 3. Historical Context: Early Anglo- Military- Mining (1845–1903)

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
mines	adits/shafts	timbers	hot fires near timbers, otherwise little risk once mapped	fuel reduction if timbers at risk	thin fuels near entrance
	tailings	none unless contaminated with volatile elements	ground disturbance	allow fires	restrict ground disturbance
	rock foundations	feature integrity	ground disturbance	avoid disturbance	restrict suppression activities
	trails/roads	feature integrity	erosion	avoid ground disturbance until well- mapped and significant sample saved	restrict suppression activities
	wells	feature integrity	erosion	avoid disturbance	restrict suppression activities
	wood & metal mining tools	dating/information, interpretive value	fuel accumulation, combustible material	suppression	thinning, restrict suppression activities
Buffalo Soldier camp	stone/concrete monument base	feature integrity	ground disturbance, erosion, intense heat	suppression	restrict line construction
	stone sentry posts	feature integrity	soot, heat, ground disturbance	allow low- intensity fire	restrict suppression activities
	viewscape	historic viewscape	loss of vegetation, vegetative type conversion	control severity of fire	time prescribed burn for lower intensity seasons, manual thinning
	tree stumps	loss	combustible material	suppression	avoid disturbance

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
Stafford Cabin cultural landscape	bottles/cans (dump)	feature integrity	heat, soot	reduce fuels, suppress, avoid ground disturbance throughout site	protect whole area with a buffer and thinning, restrict ground disturbance
	irrigation ditches	feature integrity	ground disturbance, erosion	Maintain integrity of ditch	Clear brush when necessary; avoid burning, infested with Lehmann's lovegrass
	orchard	trees	loss or damage		
	cabin	historic structure	fire, heat, soot		
	well	feature integrity	erosion, ground disturbance		
	road	feature integrity	erosion		
	hot spring	feature integrity	soot, erosion		

Table 4. Historical Context: Faraway Ranch (1886–1979)

Resource Type	Elements	Resource at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
ranch	fences, corral	feature integrity, loss	fuel accumulation, flame, heat	reduce fuels, suppress, avoid ground disturbance throughout site	protect whole area with a buffer and thinning, restrict ground disturbance
	windmills	feature integrity, loss	fuel accumulation, fire		
	swimming pool	feature integrity	heat, erosion (deposition)		
	foundations	feature integrity	soot, ground disturbance		
	machinery/artifacts	feature integrity	fuel accumulation, heat, flames, ground disturbance		
	roads/trails	feature integrity	erosion	avoid ground disturbance	restrict suppression activities
	dump	feature integrity, loss	ground disturbance	avoid ground disturbance	restrict suppression activities
landscape	orchard	loss of trees	fuel accumulation, heat, flames, ground disturbance	reduce fuels, avoid ground disturbance in these areas	protect whole area with a buffer and thinning, restrict ground disturbance; replace plantings as needed
	garden	loss	fuel accumulation, heat, flames, ground disturbance		
	ornamental plantings	loss	fuel accumulation, heat, flames, ground disturbance		

Table 5. Historical Context: Federal (1879–present)

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
USFS	boundary markers (metal)	feature integrity	ground disturbance	Suppression with water, flappers, cutting trees etc.	restrict ground disturbance
CCC Camp	trail/road	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict line construction, rehab for erosion
	foundation	feature integrity	ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict ground disturbance
	dump/bottles & cans	feature integrity, loss	ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict ground disturbance
	powder magazine building	feature integrity	ground disturbance, fire	suppression, avoid disturbance	thin fuels, use retardant
CCC works	buildings	feature integrity	fuel accumulation, flame, heat	suppression	thin fuels
	road	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict line construction, rehab for erosion
	trail system	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict line construction, rehab for erosion
	campground	integrity, viewscape	fuel accumulation	allow low- to moderate intensity fire, avoid ground	thin fuels, restrict line construction, rehab for erosion

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
				disturbance	
Mission 66	houses	integrity	fuel accumulation, heat, flame	suppression	apply full suppression, manual thinning
	visitor center	integrity	fuel accumulation, heat, flame	suppression	apply full suppression, manual thinning
	natural bridge trail	feature integrity	erosion	suppression, avoid ground disturbance	thin fuels, restrict ground disturbance